


GROUNDWATER MONITORING WORK PLAN


FOR

**FORMER ANGELES CHEMICAL
COMPANY FACILITY
8915 SORENSEN AVENUE
SANTA FE SPRINGS, CALIFORNIA**

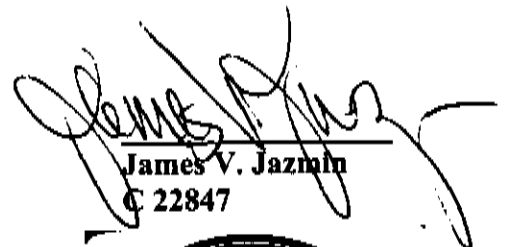
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OCTOBER 23, 2001

ANINS000242

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1.0) INTRODUCTION

Blakely Environmental Investigations, Inc. (BEII) was contracted by Greve Financial Services ((310) 753-5770) to prepare a groundwater monitoring work plan for the former Angeles Chemical Company, Inc. facility located at 8915 Sorensen Avenue, Santa Fe Springs, California (See Figure 1, Site Location Map). The work plan details the proposed work as requested by the Department of Toxics Substance Control (DTSC) correspondence dated September 18, 2001.

2.0) SITE LOCATION AND HISTORY

The site is approximately 1.8 acres in size and completely fenced. The site was bound to Sorensen Avenue on the east, Liquid Air Corporation to the northwest, Plastall Metals Corporation to the north, and a Southern Pacific Railroad easement and McKesson Chemical Company to the south.

The property was owned by Southern Pacific Transportation Company and was not developed until 1976.

The Angeles Chemical Company has operated as a chemical repackaging facility since 1976. A total of thirty-four (34) underground storage tanks (USTs) existed beneath the site. Two USTs, one gasoline and one diesel, and ten chemical USTs were excavated and removed under the oversight of the Santa Fe Springs Fire Department. Twelve (12) chemical USTs were decommissioned in place and slurry filled. The remaining ten (10) USTs are currently used as secondary containment for spill prevention. Chemicals which have been stored and used on site include, but are not limited to, acetone, methylene chloride, 1,1,1-trichloroethane (1,1,1-TCA), tetrachloroethene (PCE), methyl ethyl ketone (MEK), toluene, xylene, kerosene, diesel, and unleaded gasoline. } delete SCS Engineers

In January 1990, SCS conducted a site investigation. SCS advanced eight borings from 5' below grade (bg) to 50' bg. Soil samples collected and analyzed identified benzene, 1,1-Dichloroethane (1,1-DCA), 1,1-Dichloroethene (1,1-DCE), MEK, methyl isobutyl ketone (MIBK), toluene, 1,1,1-TCA, PCE, and xylenes at detectable concentrations.

In June 1990, SCS performed an additional site investigation at the site by advancing six additional borings advanced from 20.5' bg to 60' bg. A monitoring well (MW-1) was also installed. Soil sample analysis identified detectable concentrations of the above mentioned VOCs in addition to acetone and methylene chloride. Dissolved benzene, 1,1-DCA, 1,1-DCE, PCE, TCE, and trans-1,2-dichloroethene were detected in MW-1 above maximum contaminant levels.

Between 1993 and 1994, SCS performed further testing at the site. Soil samples were collected from nine borings. Five borings were converted to groundwater monitoring wells

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MW-2, MW-3, MW-4, MW-6, and MW-7 (See Figure 2, SCS Well Location Map). The predominant compounds detected in soil were acetone, MEK, MIBK, PCE, toluene, 1,1,1-TCA, TCE, and xylenes. Groundwater sample collection performed in February 1994 by SCS identified the following using EPA method 624 (laboratory results included in Remedial Investigation Report dated August 1994 by SCS):

Component Analyzed	MW-1	MW-2	MW-3	MW-4	MW-6	MW-7
Benzene	194	<100	63	111	795	46
1,1-DCA	649	1,130	85	1,410	2,260	2,130
1,2-DCA	<100	<100	<50	<100	1,140	31
1,1-DCE	2,210	2,460	2,800	806	1,240	151
Ethylbenzene	333	1,720	115	1,180	1,910	45
Methylene Chloride	1,220	2,980	6,530	4,760	21,400	<50
PCE	662	2,150	5,370	3,320	2,130	134
Toluene	560	7,390	579	12,700	13,500	398
1,1,1-TCA	9,370	3,470	444	36,200	114,000	90
TCE	7,160	3,040	1,730	14,300	1,320	45
Xylenes	1,750	7,790	1,014	4,362	4,710	186
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L

In 1996, SCS performed separate soil vapor extraction pilot testing beneath the site at approximately 10' bg and 22' bg. Laboratory analysis identified maximum soil vapor gas concentrations as 1,1,1-TCA (30,300 ppmV) with detectable concentrations of 1,1-DCE, TCE, methylene chloride, toluene, PCE and xylenes. The maximum radius of influence from the various extraction units used were measured as 35 feet at 10' bg and 80 feet at 22' bg.

In November 1997, SCS performed a soil vapor survey at the site. Soil vapor samples were collected at twenty-three locations at 5' bg. In addition, soil vapor samples were collected at 15' bg in five of the twelve sampling points (See Figure 3 for SCS Soil Vapor Survey). The soil vapor survey identified maximum VOC contaminants near the railroad tracks on site, the location where a rail tanker reportedly had an accidental release.

In July 2000, BEII contracted BLC Surveying, Inc. to perform a site survey. Well locations were recorded using the California Plane coordinate systems. A copy of the survey is on file with the DTSC.

In September 2000, Blaine Tech Services, Inc. gauged the six on-site monitoring wells (MW-1, MW-2, MW-3, MW-4, MW-6, and MW-7) under the supervision of BEII. Free product (FP) was identified in monitoring well MW-4 at 0.21-feet in thickness. Approximately 0.5 liters of FP were removed from the well and placed in a sealed 55-gallon drum.

BEII performed a soil vapor gas survey at the site from November 27 to December 1, 2000. A total of 36 soil vapor sample points, labeled SV1 through SV36, were selected by BEII and approved by the DTSC for analysis. Two discrete soil vapor samples were collected from

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each soil vapor sample point, one at 8' bg and one at 20' bg. SV1 was an exception since the first soil vapor sample was collected at 10' bg instead of 8' bg (See Figure 4 for BEII soil vapor sample locations). Based on the soil vapor sample results, BEII identified relatively low level concentrations of VOCs in the silty clay soils at 8' bg. However, the concentrations of VOCs are significantly higher in the sandy soils at 20' bg in OU-1. Results were submitted to the DTSC by BEII in a Report of Findings dated January 10, 2001 with laboratory reports (BEII Report of Findings dated January 10, 2001).

On November 30, 2000, Blaine Tech Services, Inc. (Blaine) was contracted to perform groundwater sampling at the site. Groundwater monitoring wells MW-4 and MW-6 identified were not sampled due to insufficient water and presence of free product. These wells were installed to monitor a perched groundwater body to the north. Free product was identified in MW-1 during sample collection, upon completion of well purging. The potentiometric groundwater level was above the well screen. Groundwater purging lowered the potentiometric level below the screened interval, allowing free product to enter. Groundwater sample analysis identified thirteen constituents of concern (COCs) in the dissolved phase as VOCs only. Laboratory analysis of metals and SVOCs identified concentrations below allowable levels for those constituents. Results were submitted by BEII to the DTSC in a Report of Findings dated January 10, 2001 with laboratory reports.

The remaining USTs have been excavated or slurry filled for closure under the supervision of the Santa Fe Springs fire Department. A report was submitted to the DTSC upon completion.

3.0) REGIONAL GEOLOGY/HYDROGEOLOGY

The site is located near the northern boundary of the Santa Fe Springs Plain within the Los Angeles Coastal Plain at an elevation of approximately 150 feet above mean sea level. Surficial sediments consist of fluvial deposits composed of inter-bedded gravel, sand, silt, and clay. Available data from California Water Resources Bulletin No. 104 (June 1961) indicate that the surficial sediments may be Holocene and/or part of the upper Pleistocene Lakewood Formation which ranges from 40 to 50 feet thick beneath the site. The Lakewood Formation has lateral lithologic changes with discontinuous permeable zones that vary in particle size. Stratified deposits of sand, silty sand, silt, and fine gravel comprising the upper portion of the lower Pleistocene San Pedro Formation underlies the Lakewood Formation.

The site lies within the Central Basin Pressure area, a division of the Central Ground Water Basin, which extends over most of the Coastal Plain. The Gasper aquifer, a part of the basal coarse unit of Holocene deposits, is found within old channels of the San Gabriel and other rivers. The Gasper aquifer may be 40-feet in thickness, with its base at a depth of about 80 to 100-feet bg. The underlying Gage aquifer is found within the upper Pleistocene Lakewood Formation. The Hollydale aquifer is the uppermost regional aquifer in the San Pedro Formation. Bulletin 104 indicates that this aquifer averages approximately 30-feet in thickness in this area,

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with its top at a depth of about 70 feet bg. The major water producing aquifers in the region are the Lynwood aquifer located approximately 200-feet bg, the Silverado aquifer located at approximately 275-feet bg, and the Sunnyside aquifer located at approximately 600-feet bg.

4.0) SITE GEOLOGY/HYDROGEOLOGY

SCS identified silty clays with some minor amounts of silt and sand in the shallow subsurface from surface grade to approximately 15' bg. Below the silty clay, poorly sorted coarse-grained sand and gravel from 15' bg to 26' bg. A less permeable silty clay layer was identified by SCS between 35' and 50' bg, which contains stringers of fine sand and silt that is part of the Gaspar/Hollydale aquifer.

Two aquifers were identified by SCS during subsurface investigations performed at the site. A perched aquifer was encountered at approximately 23' bg and the Gaspar/Hollydale aquifer was encountered at 20' to 35' bg by SCS. The groundwater gradient flows to the southwest as identified by SCS. In September 2000, the groundwater was identified between 25.98' bg to 36.15' bg beneath the site.

5.0) SCOPE OF WORK

The purpose of the proposed groundwater monitoring is to provide data regarding the piezometric surface, water quality, and the presence of free product (FP), if any on a quarterly basis to the DTSC. Groundwater monitoring will consist of such activities as water level measurement, well sounding for detection of FP, collection of groundwater samples, field analysis, laboratory analysis, and reporting. The proposed work will be performed as follows:

The depth to groundwater will be measured quarterly in each well using a decontaminated water level indicator capable of measuring to within 1/100th of a foot. Prior to and following collection of measurements from each well, the portions of the water level indicator entering groundwater will be decontaminated using a 3-stage decontamination consisting of a potable wash with water containing Liquinox soap followed by a double purified water rinse. Wells will be monitored in the order of least contaminated to the most contaminated based on past analysis. For the Angeles Chemical Co. wells, the following order of wells will be followed: MW-7, MW-3, MW-2, MW-1, MW-4, and MW-6.

The well box and casing will be opened carefully so that no debris or dirt falls into the open casing. Any water that may have seeped into the well box will be removed prior to opening the well. Once the well cap and J-Plug are removed, the water level indicator will be lowered into the well until a consistent tone is registered. Several soundings will be repeated to verify the measured depth to groundwater. The depth of groundwater will be measured from a reference point marked on the lip of each well casing. A licensed surveyor has surveyed the elevation of each reference point. The result will be recorded on the field sampling log for each well. Other relevant information such as physical condition of the well, presence of hydrocarbon

odors, etc. will also be recorded as appropriate on the field sampling log.

The well sounder used for this project will also be equipped to measure FP layers thicker than 0.1 inches or a separate product measuring device will be employed. FP will be indicated as light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPL). If FP is detected, a clear disposable plastic bailer will be lowered into the well for sample collection and recovery. If sufficient product is present to allow recovery, this will be done during the initial monitoring round and during any subsequent round when FP appears in any well.

Groundwater sampling will be conducted immediately following groundwater depth measurements. Free product present within any well will also be sampled and characterized. Provisions for FP monitoring, sampling for removal are presented in a separate section below.

Groundwater samples will be analyzed for the following constituents:

- Add H Tics*
- Volatile organic compounds (VOCs) using EPA Method 8260.
 - Title 22 (CAM 17 heavy metals) metals using EPA Method 6010 and 7471 for mercury.

Duplicate samples will be obtained at a rate of one per every ten analyses. Duplicates will be taken from a random well selected from wells that have previously contained detectable levels of compounds.

5.1) Well Purging and Measurement of Field Parameters

Wells will be purged and sampled in the following order MW-7, MW-3, MW-2, MW-1 in order to minimize the potential for cross contamination.

The wells will be purged and sampled by Blaine Tech Services, Inc (Blaine). The purge protocol is presented in the Field Sampling Plan, Appendix A.

Prior to purging, casing volumes will be calculated based on total well depth, standing water level, and casing diameter. One casing volume will be calculated as:

$$V = \pi(d/2)^2 h \times 7.48$$

where:

V is the volume of one well casing of water (in gallons, 1 ft³ = 7.48 gallon);
d is the inner diameter of the well casing (in feet); and
h is the total depth of water in the well - the depth to water level (in feet).

A minimum of three casing volumes of water will be purged unless wells are

purged to dryness. The purge rate will not exceed one gallon per minute. Water will be collected into a measured bucket to record the purge volume. All purged groundwater will be containerized in 55-gallon hazardous waste drum for disposal at a later date.

Prior to the start of purging in the middle of purging each casing volume, and after each well casing volume is purged; water temperature, pH, specific conductance (EC), and turbidity will be measured using field test meters and the measurements will be recorded on Well Sampling Records. Samples will be collected after these parameters have stabilized; indicating representative formation water is entering the well. Three consecutive measurements that display consistent values of all parameters will be taken prior to sampling. The temperature should not vary by more than $\pm 1^{\circ}\text{C}$, pH by more than 0.1 pH units, and specific conductance by more than 10 percent from reading to reading. Turbidity should be less than 5 NTUs. If these parameters have not stabilized after five casing volumes have been purged, purging will cease, a notation will be recorded in the field sampling logs and samples will be collected. Notations of water quality including color, clarity, odors, sediment, etc. will also be noted in the field sampling logs.

If a well de-waters during purging and three casing volumes are not purged, that well will be allowed to recharge up to 80 percent of the static water column, and de-watered once more. After water levels have recharged to 80 percent of the static water column, groundwater samples will be collected.

All field meters will be calibrated according to manufacturers' guidelines and specifications before and after each day of field use. Field meter probes will be decontaminated before and after use at each well. The name, model, and serial number of the field meters will be recorded on the field sampling log. The calibration standards used and expiration dates will also be recorded on the field sampling log. Any deviations noted during the day (e.g. meter drift) must also be recorded. If the meter drift requires an adjustment to any final values for field parameters, the results must be flagged in the database.

5.2) Well Sampling

Prior to sampling each well, the water level will be measured and the well purged as described in the previous section. Wells will be allowed to recharge for at least 15 minutes prior to sampling following a purge cycle.

At each sampling location, all bottles designated for a particular analysis will be filled sequentially before bottles designated for the next analysis are filled. If a duplicate sample is to be collected at this location, all bottles designated for a particular analysis for both sample designations will be filled sequentially before bottles for another analysis are filled.

Groundwater samples will be collected by lowering a disposable bailer into each well. Groundwater will be transferred from the bailer directly into the appropriate sample containers with preservative, if required, chilled, and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the bailer-emptying device to the sample containers.

Vials for VOC analysis will be filled first to minimize aeration of water in the bailer. The laboratory will provide vials containing sufficient HCl preservative to lower the pH to less than 2. The vials will be filled directly from the bottom-emptying device. The vial will be capped with a cap containing a Teflon septum. The vial will be inverted and tapped to check for bubbles to insure zero headspace. If an air bubble appears, the vial contents will be emptied into the purge drum, the vial discarded, and a new sample will be collected in new vials that have been prepared with preservatives.

Groundwater sample collection for dissolved metals will follow. The laboratory will provide 500 mL poly containers containing sufficient HNO₃ preservative. The containers will be filled directly from the bottom-emptying device.

New nitrile gloves will be worn during by sampling personnel for each well to prevent cross contamination of the samples. A solvent free label will be affixed to each sample container/vial denoting the well identification, date and time of sampling, and an identifying code to distinguish each individual bottle.

5.3) Sample Handling

VOA vials and 500 mL poly containers, including laboratory trip blanks and rinse blanks, will be placed inside of one new Ziplock bag per well and stored in a cooler chilled to approximately 4°C with bagged ice. Water samples will be logged on the chain-of-custody forms immediately following sampling of each well to insure proper tracking through analysis in the laboratory.

5.4) Laboratory Analysis

Water samples will be transported to Applied P & Ch Laboratories, a certified laboratory by the California EPA to perform the requested analysis. Samples will be analyzed on a normal turnaround basis under the QA/QC protocols presented in the Quality Assurance Project (See Appendix B). Samples will be analyzed in accordance with USEPA SW-846 methods (USEPA, June 1998). As stated above, groundwater analysis to be performed during the initial sampling event include the following:

- Volatile organic compounds (VOCs) using EPA Method 8260.
- Title 22 (CAM 17 heavy metals) metals using EPA Method 6010 and 7471 for mercury.

5.5) Reporting

Groundwater monitoring and sampling reports will be submitted to DTSC on a quarterly basis. Reports will include the following information:

- Results of groundwater elevation and FP monitoring.
- Well purging and sampling protocols.
- Laboratory analytical results and chain-of-custody documentation.
- Groundwater contour map indicating current flow conditions.
- Tabulated well construction and elevation data.
- Tabulated analytical results including historical data.
- QA/QC assessment.
- Copies of groundwater Field Sampling Logs.
- Results of FP and disposal (as appropriate).
- Detailed description of any deviation from the work plan.
- Assessment of significant changes since the previous reporting period.
- Summary and recommendations, including a discussion of any outstanding issues.

The report will be signed by the registered civil engineer under whose supervision the monitoring was conducted and by each member of the field team. The report will contain a table of contents and numbered pages.

5.6) Schedule

Initial groundwater level monitoring and well sampling will be performed prior to October 31, 2001. Groundwater monitoring will be performed on a quarterly basis during the last week of January, April, July, and October. Any additional installed groundwater wells will be included in the quarterly groundwater monitoring.

5.7) Waste Management

Free product will be stored in sealed 55-gallon drums or similar containers for period not exceeding 90 days. Stored wastes will be profiled for hazardous constituents and characterized as Non-Hazardous, California Hazardous, or RCRA Hazardous, as appropriate.

All wastes including FP, decontamination water, and purge water will be properly stored in 55-gallon drums, characterized, and disposed as appropriate. Any transportation of waste will be under appropriate manifest.

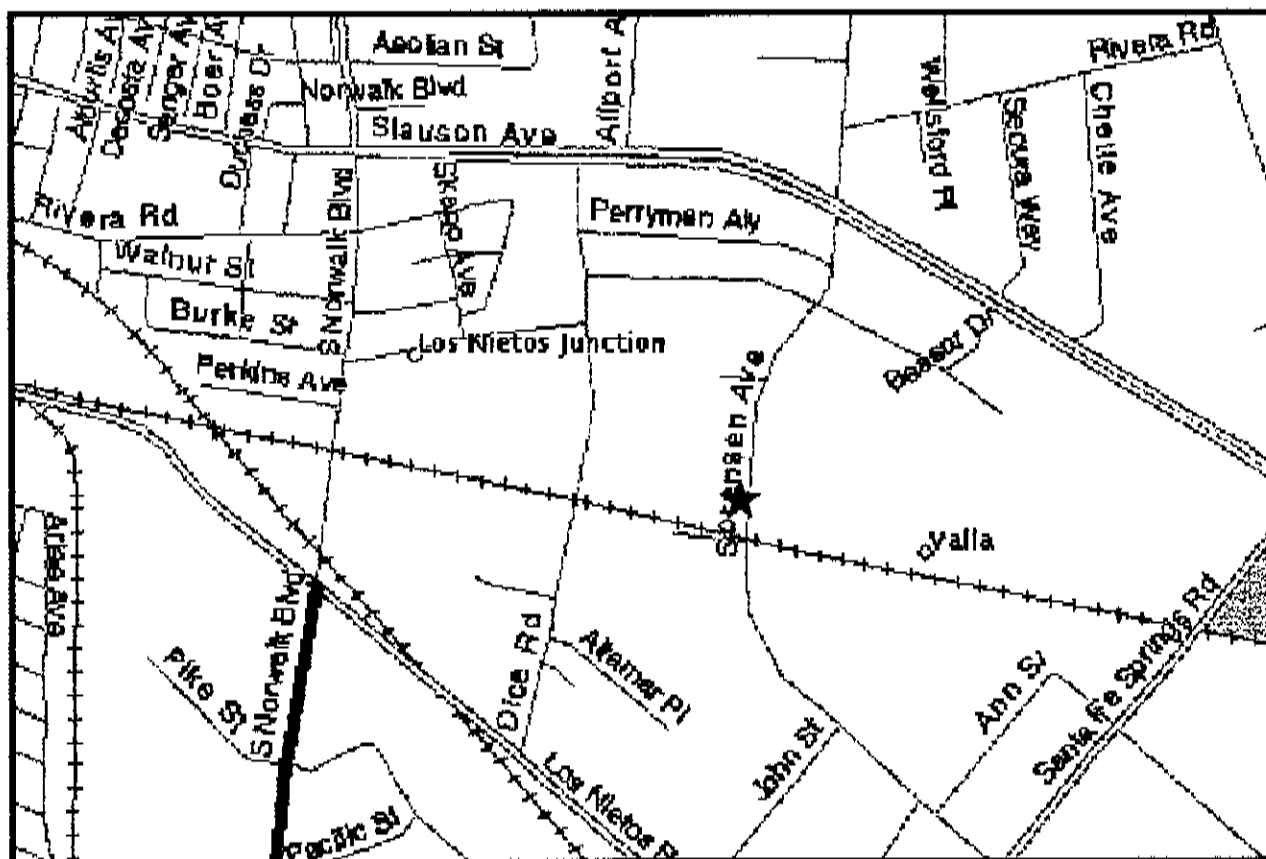
6.0) HEALTH AND SAFETY PLAN

The purpose of the project Health and Safety Plan (HASP) is to provide guidelines and

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procedures to ensure the health and physical safety of people working at the Angeles Chemical Company facility. The goal of the HASP is to provide precautionary and responsive measures for the protection of on-site personnel, the general public and the environmental. A HASP is included as Appendix C.

FIGURES



★ 8915 Sorensen Avenue



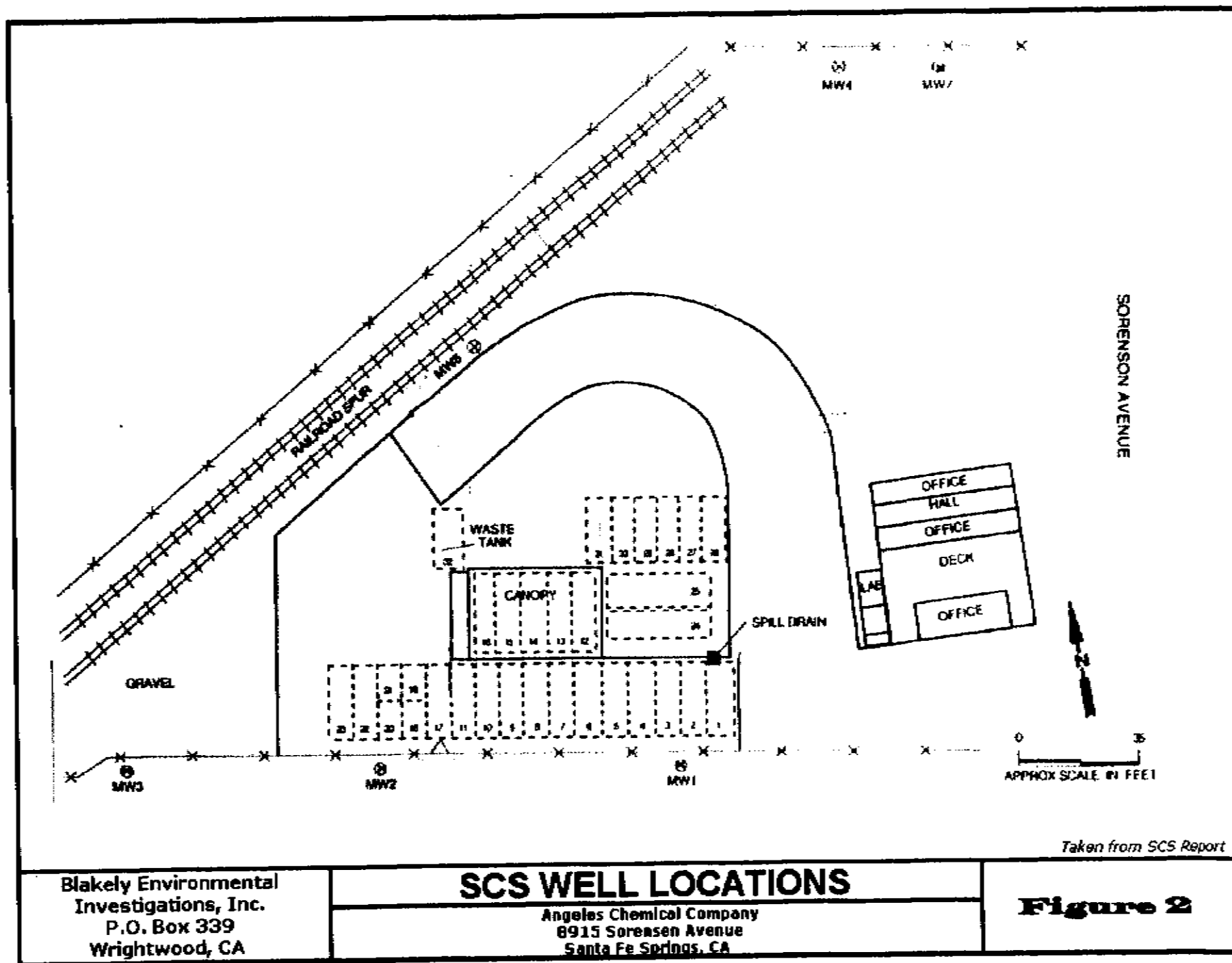
Site Location

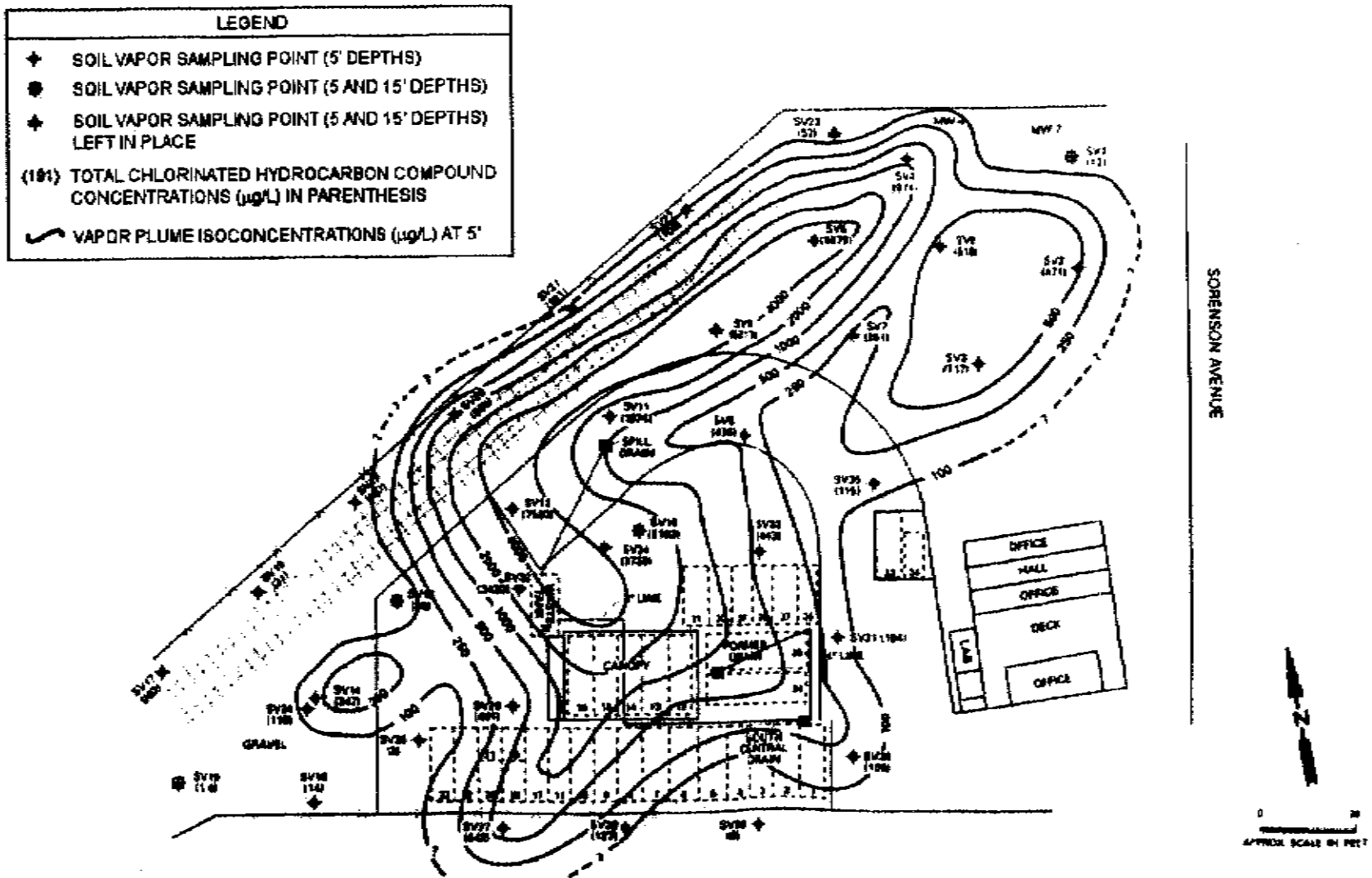
**Former Angeles Chemical Company
8915 Sorensen Avenue
Santa Fe Springs, CA**

FIGURE 1

Blakely Environmental
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ANINS000254





Total Chlorinated Hydrocarbon Compound Isoconcentrations at 5' Below Grade

Taken from SCS Report

**Blakely Environmental
Investigations, Inc.
P.O. Box 339
Wrightwood, CA**

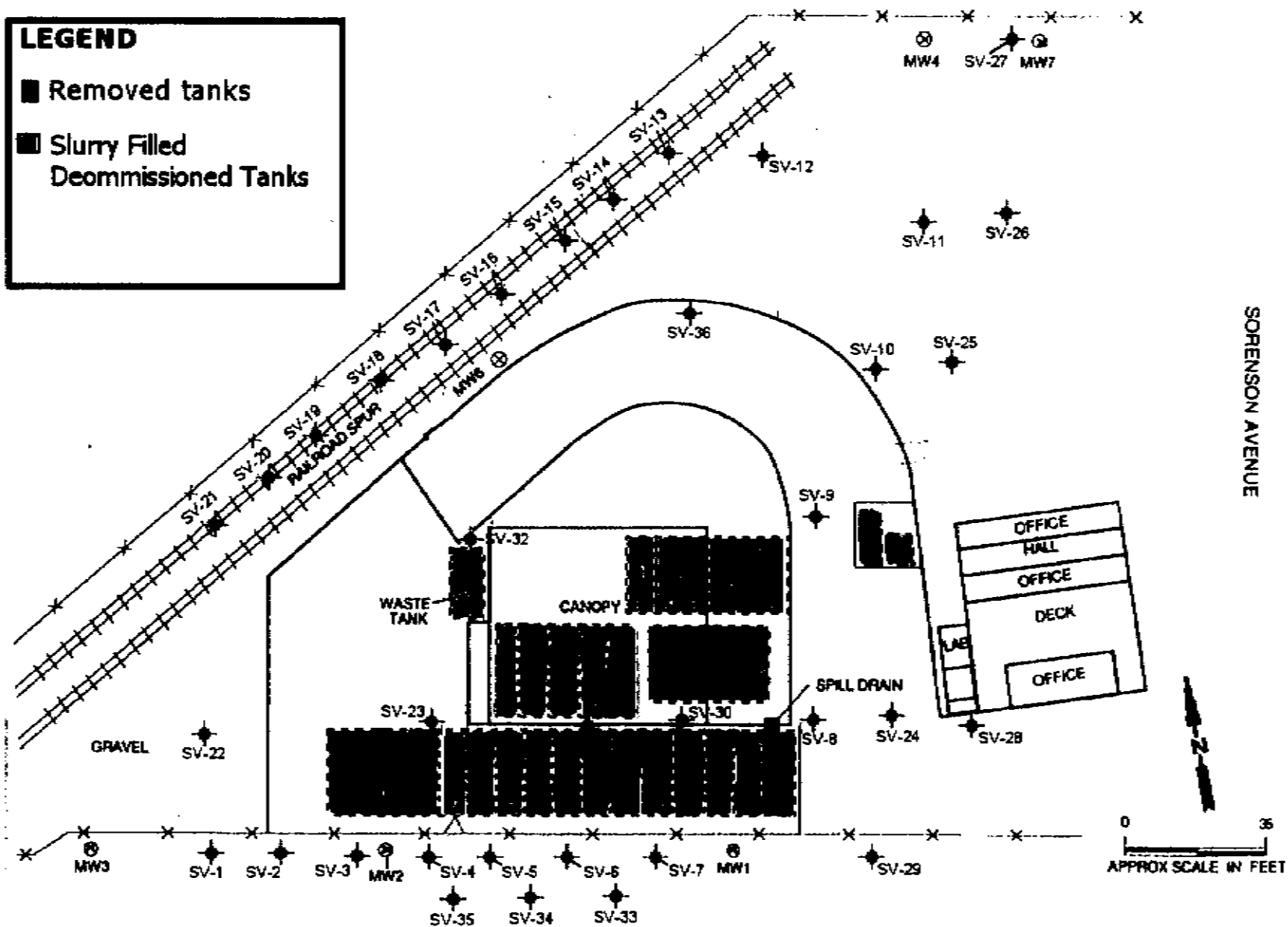
SCS Soil Vapor Survey Points

Angeles Chemical Company
8915 Sorensen Avenue
Santa Fe Springs, CA

FIGURE 3

LEGEND

- Removed tanks
- Slurry Filled Deommissioned Tanks



Taken from SCS Report

Blakely Environmental
Investigations, Inc.
P.O. Box 339
Wrightwood, CA

BEII Soil Vapor Sample Locations

Angeles Chemical Company
8915 Sorensen Avenue
Santa Fe Springs, CA

FIGURE 4

ANINS000256

APPENDICES

A

FIELD SAMPLING PLAN
Former Angeles Chemical Company Site
8915 Sorenson Avenue
Santa Fe Springs, CA

1.0 INTRODUCTION

This Field Sampling plan (FSP) has been prepared by Blakely Environmental Investigations, Inc. (BEI) on behalf of Greve Financial Services (Greve). The purpose of this FSP is to describe the procedures and protocols that BEI staff will follow during quarterly groundwater sampling as part of the remedial investigation at the site. Information related to site history and previous assessments are discussed in the Work Plan.

2.0 PROJECT DESCRIPTION AND SAMPLING OBJECTIVES

Work that will be conducted according to this FSP includes:

- Collection of groundwater samples for analysis of volatile organic compounds (VOCs), dissolved metals, and other chemical and physical parameters (i.e., pH, conductivity, temperature).

3.0 SAMPLE LOCATIONS AND CHEMICAL ANALYSES

Details of sampling frequency, chemical analyses, and quality assurance/quality control (QA/QC) protocols are presented in Sections 3.1 and 3.2.

3.1 Sampling Frequency and Chemical Analyses

This section describes the sampling frequency of groundwater sampling and chemical analytical methods.

3.1.1 Groundwater Samples

Groundwater samples will be collected for chemical and physical analysis during groundwater sampling operations. Groundwater sampling will be performed on a quarterly basis as requested by the DTSC. Groundwater samples will be collected in general conformance with the protocols presented in Section 5.1.4.

Groundwater samples will be analyzed using the following methods to obtain data for delineating the extent of the constituents of concern (COCs) in groundwater:

- USEPA Method 8260 for volatile organic compounds (VOCs);
- USEPA Methods 6000/7000 series for dissolved metals.

3.2 Chemical Data Quality Control And Quality Assurance Samples

QA and QC efforts are designed to check whether laboratory chemical data are of suitable quality for their intended purpose. In general, QA and QC activities require the collection of additional samples and the comparison of duplicate sample results with the results of primary samples. The following sections define the QC and QA samples that will be collected.

4.0 FIELD DOCUMENTATION

This section describes the field documents to record the daily field events and activities during quarterly groundwater sampling fieldwork.

4.1 Field Forms

The following forms may be utilized to document field activities. Copies of these forms are included in this Appendix.

- **Daily Field Record.** A Daily Field Record will be prepared during the course of each day summarizing the description and location of work performed, decontamination procedures, any materials received on-site, personnel log, and any unusual incidents.
- **Chain-of-Custody Record.** Sample collection information identifying sample identification, sample collector, date, time, requested analyses, preservation, and special handling requirements will be recorded on a Chain-of-Custody Record.
- **Sample Log Control.** In addition to the Chain-of-Custody Record, the sample type and method of collection will be recorded on a Sample Control Log.
- **Field Instrument Calibration Sheet.** Field instrument calibration data will be recorded on a Field Instrument Calibration form.

5.0 EQUIPMENT AND PROCEDURES

This section presents the equipment and procedures for pre-field activities necessary to complete the site investigation fieldwork.

5.1 Groundwater Sampling

The following protocols will be followed during groundwater sampling activities. Groundwater and free product levels will be measured in all wells on-site with an oil/water interphase probe. Free product will be indicated as light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPL). Groundwater purging will then begin in each well using a submersible pump to remove three well volumes of groundwater. Temperature, conductivity, and pH will be measured at the beginning and middle of groundwater purging, and prior to groundwater sample collection.

Groundwater will be collected when the above groundwater parameters are within 80% of initial readings. Groundwater samples will subsequently be collected in two 40 mL glass VOAs preserved with HCl for VOC analysis and one 500 mL poly container preserved with HNO₃ for dissolved metals analysis.

5.2 Equipment Decontamination Procedures

Equipment decontamination procedures are intended to reduce the possibility of sample contamination and cross contamination between monitoring wells. All non-disposable purging and sampling equipment such as pumps, bailers, and oil/water interphase probes that contact groundwater will be decontaminated with a three-step wash. The three-step wash consists of cleaning equipment with potable water with Liquinox® and rinsing with potable water and de-ionized water.

6.0 SAMPLE IDENTIFICATION, PRESERVATION, CUSTODY, PACKING, AND TRANSPORTATION PROCEDURES

This section describes the protocols for the labeling, handling, and transportation of groundwater samples collected during quarterly groundwater sampling.

6.1 Sample Identification

Each sample collected at the site will be labeled with the following information:

- Sample identification number;
- Sample location;
- Date and time of collection;
- Initials or signature of person collecting sample;
- Analyses requested;
- Preservation; and
- Any other information pertinent to the sample.

Groundwater samples will be stored in an ice chest with ice and transported to the laboratory for analysis.

6.2 Chain-Of-Custody Procedures

Custody of samples must be maintained and documented from the time of sample collection to completion of analyses. Each sample will be considered to be in the sampler's custody, and the sampler will be personally responsible for the care and custody of the samples until they are delivered to the courier service for delivery to the laboratory or taken directly to the laboratory. A sample is considered to be in a person's custody if:

- The sample is in the person's physical possession;
- The sample is in view of the person after that person has taken possession;

- The sample is secured by that person so that no one can tamper with the sample; or
- The sample is secured by that person in an area that is restricted to authorized personnel.

All samples will be accompanied to the laboratory by a chain-of-custody form. The chain-of-custody form contains the following information:

- Project name;
- Sample numbers;
- Sampling date;
- Time of collection of sample (this time must match the time recorded on the sample label);
- Name of person collecting the samples;
- Sample description;
- analyses requested for each sample;
- preservation method and containers used; and
- any special handling or analysis requirements.

The chain-of-custody record forms will be completed in ink. When the samples are transferred from one party to another, the individuals will sign, date and note the time on the form. A separate form will accompany each delivery of samples to the laboratory. The chain-of-custody form will be included in the cooler used for preservation and transport of samples. The sampling personnel will retain a copy of the form.

When samples are received at the laboratory, the condition of samples will be examined. The results will be recorded by the project laboratory on the chain-of-custody form.

7.0 INVESTIGATION-DERIVED WASTES

Water removed from a well during installation, development, and hydraulic testing will be disposed of as directed by Greve. Containers used for the storage of purge/decontamination water shall be labeled as "investigation-derived waste pending analysis." Containers will be located in areas agreed upon by Greve and BEIL. All containers filled as part of the quarterly groundwater sampling will be properly labeled and inventoried as to their contents and source.

B

QUALITY ASSURANCE PROJECT PLAN

Former Angeles Chemical Company Site

8915 Sorenson Avenue

Santa Fe Springs, California

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared by Blakely Environmental Investigations, Inc. (BEII) on behalf of Greve Financial Services, (Greve). The purpose of this QAPP is to describe the quality assurance/quality control (QA/QC) procedures that BEII staff will follow during quarterly groundwater sampling at the former Angeles Chemical Company site. The QAPP also assures collection and reporting of data that are representative of field conditions suitable for site characterization and use in risk assessment

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Personnel assigned to the project will be required to familiarize themselves with pertinent protocols and procedures presented in the QAPP. Field sampling procedures are presented in a companion document, the Field Sampling Plan (FSP), which is included as part of the work plan. BEII project team personnel will receive instruction for activities planned for this project regarding the objectives of QA/QC controls prior to beginning field operations and data compilation efforts. Experienced BEII staff will oversee and review all procedures related to data collection and analysis.

3.0 QUALITY ASSURANCE OBJECTIVES FOR COLLECTION AND MEASUREMENT OF DATA

Quality assurance objectives are intended to provide guidance for collecting and evaluating data for the quarterly groundwater sampling that represent site conditions and are suitable for use in the risk assessment. The parameters used to evaluate data quality and their definitions are as follows:

- **Precision** – measurement of the degree of agreement of replicate data, which is Quantitatively assessed based on the relative percent difference or standard deviation.
- **Accuracy** – agreement of a measurement with an accepted reference or true value.
- **Completeness** – amount of valid data obtained from a prescribed measurement system throughout the project as compared with that expected and required to meet the project goals.

- Representativeness – the degree to which data represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition.
- Analytical detection limits – selection of analytical methods that obtain detection limits that allow evaluation of numerical project goals and are suitable for use in the risk assessment.

Laboratory analyses will include routine analyses of groundwater. The actual number of samples is presented in the FSP. Analyses of groundwater samples will be performed by Applied P & CH Laboratories of Chino, California (APCL). HP Labs quality assurance manual is presented in Appendix E. APCL's quality assurance manual is presented in **Attachment A**.

The goals for assessing precision and accuracy of laboratory measurements are consistent with those put forth in the descriptions of the above-listed EPA Test Methods contained in SW-846 (USEPA, 1996) 600/4-89-017 (USEPA, 1988b) 600/R-93/100 (USEPA, 1993) and ASTM Annual Book of Standards (ASTM, 1998). If other EPA methods are used, laboratory goals for precision and accuracy will be consistent with those put forth in these and other appropriate EPA documents, and the laboratory internal procedures as included in Attachment A.

Representative field and laboratory data will be obtained through the use of consistent methods of sample collection and sample preservation. These methods, described separately in the FSP, include groundwater sampling protocols.

Comparability of data throughout the project will be attained by recording field and laboratory data in consistent units, as well as following consistent methods for collecting and analyzing samples as described in the FSP. Parameters commonly or anticipated to be measured for this project and their associated units are listed below:

<u>Parameter</u>	<u>Units</u>
VOC concentrations	µg/L
Dissolved Metals	µg/L

4.0 SAMPLE COLLECTION AND SAMPLE CUSTODY PROCEDURES

The sampling and sample custody requirements and procedures to be followed in the field and in the laboratory for groundwater samples are described below.

4.1 SAMPLE COLLECTION

The procedures that field personnel will follow while collecting groundwater samples are presented in Sections 4.0 and 5.0. Departures from the procedures must be documented and approved by the Project Manager.

4.2 SAMPLE CUSTODY PROCEDURES

Sample types, identification, collection procedures, and analytical methods will be established before field samples are collected. Personnel involved in sample collection will be responsible for sample labeling, preservation (where appropriate), transport, and tracking until the samples are in the custody of the analytical laboratory or courier delivery service for transport to the laboratory. The protocols contained in the FSP describe the procedures for sample custody between the time of sample collection and receipt of samples by the analytical laboratory. The type of sample container(s) used will be recorded in a sample control log and on the chain-of-custody record. Each groundwater sample to be submitted for analysis, will be placed or retained in an appropriate container, which will be sealed in a sealable plastic bag before being placed in a transport cooler with ice (as required for sample preservation) for delivery to the laboratory. Sample custody at the analytical laboratory is the responsibility of laboratory personnel.

Laboratory custody and documentation procedures for handling of samples will be in accordance with the procedures outlined below.

- A. Receipt of Samples at the Laboratory. Individuals designated as the sample custodians will be responsible for the receipt of the samples at the laboratory. Upon sample delivery, the custodians will:
- Record the date and time on the chain-of-custody
 - Observe and note the physical condition of the sample container(s).
 - Verify that the information on the chain-of-custody record corresponds to that on the sample labels and that proper preservation protocols have been followed.
 - Record the information on the sample labels into a laboratory notebook.
 - Report any sample damage, sample leakage, documentation discrepancy, or improper preservation condition to the laboratory supervisor and the Project Manager and record this information in the laboratory notebook.
 - Sign the chain-of-custody record, including the date and time received, and stores the record in a secure location.
 - Place the samples in a secured storage container at all times.

5.0 CALIBRATION PROCEDURES

The calibration procedures to be followed in the field and laboratory are described below.

5.1 FIELD PROCEDURES

Quantitative field data to be obtained during the groundwater quality assessment and monitoring include field-screening measurements of VOCs. Protocols presented in FSP describe the instruments used and the calibration methods, standards, and frequency requirements for each instrument.

5.2 LABORATORY PROCEDURES

Calibration procedures and frequency of calibration for laboratory instruments are described in the quality assurance manuals for the analytical laboratories (Attachment A), and will follow method requirements as specified in SW-846 (USEPA, 1996), 600/4-89-017 (USEPA, 1988), and 600/R-93/100 (USEPA, 1993).

6.0 DATA ASSESSMENT AND MANAGEMENT

The methods for assessing and handling field and laboratory data are discussed below.

6.1 DATA ASSESSMENT

As discussed in Section 3.0, the validity of chemical data will be measured in terms of precision, accuracy, completeness, and representativeness. In addition, analytical methods selected will obtain method detection limits (MDLs) that allow evaluation of numerical project goals. The ways in which precision, accuracy, completeness, and representativeness will be evaluated for project data are described below.

6.1.1 Precision

For chemical data generated by the laboratory, data precision will be estimated by comparing analytical results from matrix spikes and matrix-spike duplicates. The comparison will be made by calculating the relative percent difference (RPD) given by:

$$RPD = \frac{2(S_1 - S_2)}{S_1 + S_2} \times 100$$

Where S_1 = sample
 S_2 = duplicate

This information will be calculated and reviewed periodically by the Project Manager. RPD goals are applicable only for samples with detected concentrations greater than five times the reporting limit.

The standard methods used for these analyses are widely recognized, and published by the ASTM. This agency provides information on precision goals that are achievable and expected for the various methods. The standard methods to be used, the entity responsible for the issuance of the standard, and the anticipated precision for each, are described in the laboratory method.

6.1.2 Accuracy

Data accuracy will be assessed for laboratory data only and is based on recovery (R), expressed as the percentage of the true (known) concentration, from laboratory-spiked samples and QA/QC samples generated by the analytical laboratory. The equation for calculating recoveries is:

$$R = \frac{(A - B)}{T} \times 100$$

Where A = measured concentration after spiking

B = background concentration

T = known true value of spike

This information will be reviewed periodically by the Project Manager. These goals may need to be modified depending upon potential matrix interference associated with the site samples. Alteration or failure to meet these preliminary goals should not be construed to indicate that the data collected should be invalidated because all of the data should be suitable for site characterization and risk assessment as long as the uncertainty associated with the data is adequately characterized (USEPA, 1992).

6.1.3 Completeness and Corrective Actions

Data generated during the subsurface investigation will be evaluated for completeness, that is, the amount data meeting project QA/QC goals. If data generated during field operations or via analytical procedures appear to deviate significantly from observed trends, the Project Manager will review field or laboratory procedures with the appropriate personnel to evaluate the cause of such deviations. Where data anomalies cannot be explained, re-sampling may be necessary.

6.1.4 Representativeness

The representativeness of the data is the degree to which data represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. analytical data should represent the sample analyzed regardless of the heterogeneity of the original sample matrix. Representativeness will be evaluated by use of proper collection protocols.

6.2 MANAGEMENT OF FIELD DATA

Field data will be recorded on field data sheets as they are collected and will be maintained in BEII's office project file. The Project Manager will review field procedures and compare field data to previous measurements. Field personnel are responsible for monitoring the collection and reporting the field data. Field personnel also will review field measurements at the time of measurement and will re-measure a parameter, as necessary.

6.3 MANAGEMENT OF LABORATORY DATA AND DATA REDUCTION

Results of laboratory analyses will be reported as specified in the work plan according to the data quality objectives and deliverables inventory. Analytical data will be summarized in tabular format with such information as sample identification, sample matrix description, parameters analyzed and their corresponding detected concentrations, and the detection limit. Analytical results will be incorporated into reports as data tables, maps showing sampling locations and analytical results, and supporting text.

Analytical results will be reported in units of final use. Laboratory calculations will be performed as prescribed for a given analytical method or in conformance with acceptable laboratory standards at the time the calculation is performed. Quality assurance, quality control (QA/QC) records will be retained by each laboratory for at least six years. Copies of raw data and supporting data validation information will be available for review at the laboratory and also may be requested as part of BEII's QA/QC review. Original laboratory reports will be stored in the BEII project files. Laboratories will provide the data in hard copy and electronic format.

7.0 INTERNAL QUALITY CONTROL

The requirements and procedures for maintaining quality control for project data are described below.

7.1 QUALITY CONTROL SAMPLES

To evaluate the precision and accuracy of analytical data, quality control samples will be analyzed periodically for this project. The minimum project requirements for collection and analyses of these samples are listed below and are specified in the FSP.

7.1.1 Matrix Spikes and Matrix-Spike Duplicates

A matrix spike is an aliquot of a project soil sample to which the laboratory adds a known quantity of a compound prior to sample extraction/digestion and analysis. The reported percent recovery of the known compound in the sample indicates the presence or absence of any effects of the matrix on the sample analyses. A matrix-spike duplicate is an aliquot of the matrix-spike sample that is analyzed separately; the results indicate the

precision of the analytical method. A matrix-spike and matrix-spike duplicate analysis will be performed according to Attachment A.

7.1.2 Method Blanks

A method blank consists of a laboratory-prepared sample that is carried through the entire analytical procedure. The purpose of this sample is to check for laboratory contamination during preparation and analysis of soil or groundwater samples. Method blanks will be prepared according to Attachment A.

7.1.3 Laboratory Control Standard

A laboratory control standard (LCS), or check sample, is a groundwater sample prepared by the laboratory or a reliable source that contains known concentrations of the analytes of concern. It is subjected to the same preparation/extraction procedures as a groundwater sample, and is independently of calibration standards. The LCS recovery checks the accuracy of the analytical methods and equipment, and will be prepared according to Attachment A. LCS recoveries should fall within the limits set by the laboratory.

7.1.4 Laboratory Surrogate Compounds

A surrogate spike is an addition to the soil sample of a known concentration of an organic compound that is not expected to be a compound of concern in the sample. Every blank, QC sample, and project sample will be spiked with surrogate compounds if specified in the particular analytical method. Surrogate recovery should fall within the limits set by the laboratory in accordance with procedures specified by the method.

7.2 DATA REVIEW AND VALIDATION

The Project Manager will review laboratory data. Section 7.1 outlines the procedures for evaluating the precision and accuracy of data. If comparison of data to previous measurements or known conditions at the site indicates anomalies, the laboratory will be instructed to review the submitted data while BEII reviews the methods used to collect and handle the samples. If anomalies remain, the laboratory may be asked to re-analyze selected samples. Any laboratory used will be instructed to review the data in accordance with its quality assurance annual, which prior to the start of the laboratory program will be reviewed by BEII.

7.3 PERFORMANCE AND SYSTEM AUDITS

The Project Manager will audit field and analytical activities throughout the project. The audit program consists of:

- Observing field activities to confirm that procedures are performed in accordance with project procedures and methods described in the FSP and Sections 4.0 and 5.0;

- Reviewing daily field records, sample control logs, and any other data collection sheets during and after field measurements; and
- Reviewing laboratory analytical data (Section 7.2).

The analytical laboratories are required to audit their operations in accordance with its project specific quality objectives. Laboratory procedures will be reviewed, as necessary, by assigned project personnel.

7.4 PREVENTATIVE MAINTENANCE

Each piece of field equipment will be checked according to its routine maintenance schedule and before field activities begin. Spare parts, including batteries, and dissolved oxygen meter probes, and other items required for collecting field data will be stored with field equipment to reduce field downtime. The appropriate field personnel will report equipment maintenance and/or replacement needs to the Project Manager and record the information on the daily field record. The laboratory is required to perform preventive maintenance as prescribed in its laboratory quality assurance manual.

7.5 CORRECTIVE ACTIONS

The initial step in corrective action will be to instruct the analytical laboratory to examine its procedures to assess whether analytical or computational errors caused the anomalous results. At the same time, sample collection and handling procedures will be reviewed to assess whether they could have contributed to the anomalous results. Based on this evaluation, the Project Manager will assess whether re-analysis or re-sampling is required or whether any protocol should be notified for future sampling events. Laboratory corrective actions will be described in the laboratory quality assurance manuals. Any changes in laboratory methods, reporting limits, or quality assurance parameters or limits require written approval by BEII prior to implementation by the laboratory.

7.6 QUALITY ASSURANCE REPORTING

Reports that describe sampling activities and results will contain BEII's evaluation of the quality of the data obtained and the laboratory's QA/QC report. These reports will be prepared by the Project Manager and reviewed by senior BEII personnel. Unless otherwise specified, the laboratory will retain raw data and quality assurance documentation for chemical analyses for at least six years after generation.

Attachment A

ANINS000269

Applied P & Ch Laboratory
13760 Magnolia Ave. Chino CA 91710
Tel: (909) 590-1828 Fax: (909) 590-1498

Standard Operation Procedure

F-63 VOCs by GC/MS 8260B EPA 8260B

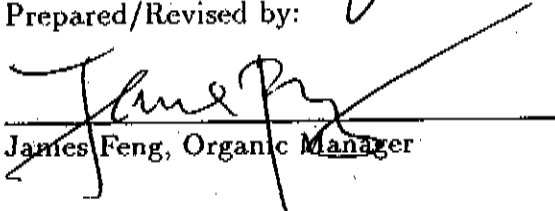
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Version No 8.0
Revision Date 08/2000

VALIDATED

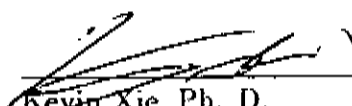
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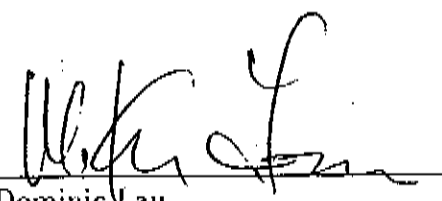
APCL BY 

Prepared/Revised by:


James Feng, Organic Manager

Approval:


Kevin Xie, Ph. D.
QA Director


Dominic Lau
Laboratory Director

§ 1.0 Scope and Application

This procedure describes a method to analyze purgeable volatile organics. This method utilizes a gas chromatograph installed with a capillary column connected to a mass spectrometer (MS). Method detection limits are about 0.5 µg/L for water, and 1 µg/kg for soil, respectively. PQL for some water soluble compounds are about 10 times higher than other analytes. The analysis time for each run is approximately 40 minutes.

§ 2.0 Method Summary

Volatile hydrocarbons and surrogates with low water solubility are purged from the sample matrix by bubbling an inert gas through the sample. Purged sample components are trapped in a tube containing suitable sorbent materials. When purging is complete, the sorbent tube is heated and backflushed with helium to desorb the trapped sample components into a capillary gas chromatograph column which is connected to MS. The column is temperature programmed to separate the analytes which are then identified and quantitated by MS.

§ 3.0 Interferences

Major contaminant sources are volatile materials in the laboratory and impurities in the reagent water, in the inert purge gas, and in the sorbent trap. Analyses of laboratory reagent blanks provide information about the presence of contaminants. Interfering contamination may also occur when a sample containing low concentrations of analytes is analyzed immediately after a sample containing relatively high concentrations of the analytes. It is recommended that one or more laboratory reagent blanks be analyzed after the analysis of a highly contaminated sample to check for cross contamination. Volatile organics such as methylene chloride and fluorocarbons can diffuse through the septum seal into the sample during shipment and storage. Analysis of a field blank sample can serve as a check on such contamination.

§ 4.0 Safety

The toxicity or carcinogenicity of chemicals used in this method has not been precisely defined; each chemical should be treated as a potential health hazard, and exposure to these chemicals should be minimized. Pure standard and stock standard solutions

of these analytes should be handled in a hood. A NIOSH/MESA approved toxic gas respirator should be worn when the analyst handles high concentrations of these toxic compounds.

§ 5.0 Sample Collection, Preservation, Containers and Holding Time

¶ 5.1 Water samples

Water samples should be collected in vials or containers specifically designed to prevent loss of volatile constituents from the sample. No headspace should be present in the sample container once the container has been capped. In cases where it is not possible to collect a sample without air bubbles, the investigator should record the problem and account for possible error. The collected samples should be refrigerated at 4 °C using blue ice during transport and analyzed within 7 days of collection (14 days if preserved).

¶ 5.2 Soil samples

Soil, sampled by a backhoe or a coring device, should be collected in pre-cleaned thin-walled stainless steel or brass cylinders at least three inches long by one inch diameter. About one inch of soil should be removed from the immediate surface area where the sample is to be taken. No headspace should be present in the cylinder once the sample is collected. Each end of the cylinder should be covered with aluminum foil or Teflon film and then capped with a polyethylene lid, taped and labeled. The sample should then be immediately placed in an ice chest containing dry ice or blue ice and kept refrigerated for delivery to the laboratory. Samples should be kept refrigerated at the laboratory until they are analyzed. Holding time should not exceed 14 days from the time of collection.

In the Update III of SW846, VOC soil samples are analyzed by the closed system purge and trap method. Soil samples are collected by a coring tool or stored in the VOA vial containing sodium bisulfate solution. Refer to sections 9.4-9.6 for analytical procedures.

Holding times for low level soil samples stored in the coring device is 48 hours from collection. If soils are preserved in sodium bisulfate solution or methanol, holding time is 14 days from collection.

Another way of preservation is to freeze the coring samples at 10 to -20 °C. If

kept frozen, holding time can be extended by 7 days before analysis. This preservation method is proposed by EPA region IX and is a preferred method at APCL. However, since this method has not been officially approved by EPA, analysts are cautioned that other preservation methods may be required depending on project specific requirements.

¶ 5.3 Containers, Preservatives and the Holding Times

The following table summarizes the containers, preservatives and the holding times for water samples.

Containers, Preservation, and Holding Times for Water Samples

Method	Container	Preservation	Max. Holding Time
8260B	Glass	Cool, 4°C	14 days
	septum (Telfon lined)	pH <2 w/ HCl	(7 days if unpreserved)

§ 6.0 Apparatus and Equipment

At present, APCL has four GC/MS systems dedicated to organic volatile analysis: system "C", "Q", "X", and system "G". The next sections are the descriptions of the equipped instruments of the systems and their operation conditions.

¶ 6.1 GC-MS system "Q".

This system consists of an HP5890II GC, an HP5971A MS, a Tekmar LCS 3000 purge-and-trap equipped with a moisture control modul, a Tekmar ALS 2016 and 2032 samplers with 32 25-ml spargers. The data acquisition and analysis system consists of Hewlett-Packard's HP Chemstation MS1034 version C installed on a Pentium PC.

Column	J&W DB-5, 60M × 0.32mm, film thickness 3 μ m.
Carrier gas	Helium at 0.8 mL/min (8 psi)
Oven temperature program	Initial temperature 45 °C, hold 2 min., ramp at 5 °C/min to 75 °C ramp at 15 °C/min. to 180 °C ramp at 20 °C/min. to 260 °C and hold 2 minute. (The whole run is 21.0 min.)
Split/splitless inlet vent flow	20 ml/min
Purge system	Tekmar LCS 3000 equipped with a moisture control modul

Trap	Supelco "K"
Purge pressure	Helium at 20 psi.
Purge flow	40 mL/min.
Purge time	11 minutes.
Dry purge time	2 minutes.
Purge temperature	Room Temperature (< 35 °C)
MCM desorb	cooled to 40 °C
Desorb preheat	220 °C
Desorb temperature	225 °C
Desorb time	1 minutes.
Bake Temperature	260 °C
Bake time	10 minutes.

¶ 6.2 GC-MS system "G", by 25 mL Purge-and-Trap

This system consists of an HP5890II GC equipped with a jet separator, an HP5971A MS, a Tekmar LCS 2000 purge-and-trap equipped with a cryofocusing modul, Tekmar ALS 2016 and ALS 2032 samplers with 32 25-mL Frit spargers. The data acquisition and analysis system consists of Hewlett-Packard's HP Chemstation MS1034 v.C installed on a Pentium PC. This instrument can be used for low level water sample analysis.

Column	Supelco Vocol, 105M × 0.53mm, film thickness 3.0µm.
Oven temperature program	Initial temperature 30 °C, hold 3 minutes, ramp at 6 °C/min to 90 °C then ramp at 19 °C/min to 225 °C and hold 11 minutes. (The whole run is 31.11 min.)
Carrier gas	He at 10ml/min (18psi).
Jet separator pressure	0.4 mTorr (achieved by adjusting the makeup gas flow)
Trap	Supelco "K"
Purge pressure	Helium at 22 psi.
Purge flow	50 mL/min.
purge time	13 minutes.
Dry purge time	2 minutes.
Purge temperature	Room Temperature (< 35 °C)
Desorb preheat	220 °C

Desorb temperature	250 °C
Desorb time	2 minutes.
Bake Temperature	260 °C
Bake time	8 minutes.

¶ 6.3 GC-MS systems "X" and "C"

The instruments consist of an ARCHON closed system purge and trap autosampler, an HP5890II GC, an HP5972s MS, a Tekmar LCS 3000 purge-and-trap equipped with a moisture control modul. The data acquisition and analysis system consists of Hewlett-Packard's HP Chemstation MS1034 version C installed on a Pentium PC. Both instruments are capable of analyzing soil samples using SW5035. Procedures of SW5035 analysis are also described in this SOP, sections 9.4 - 9.6.

Column	J&W DB-5.624, 60M × 0.25mm, film thickness 1µm.
Carrier gas	Helium at 0.8 mL/min (8 psi)
Oven temperature program	Initial temperature 45 °C, hold 2 min., ramp at 5 °C/min to 75 °C ramp at 15 °C/min. to 180 °C ramp at 20 °C/min. to 260 °C and hold 2 minute. (The whole run is 21.0 min.)
Split/splitless inlet vent flow	10 ml/min
Purge system	Tekmar LCS 3000 equipped with a moisture control modul
Trap	Supelco "K"
Purge pressure	Helium at 20 psi.
Purge flow	40 mL/min.
Purge time	11 minutes.
Dry purge time	2 minutes.
Purge temperature	Room Temperature (< 35 °C)
MCM desorb	cooled to 40 °C
Desorb preheat	220 °C
Desorb temperature	225 °C
Desorb time	1 minutes.
Bake Temperature	260 °C

Bake time 10 minutes.

¶ 6.4 ARCHON autosampler setting parameters

Soil Method	
Preheat Temp	40 °C
Preheat Time	0.5 min
Purge Time	11 min
Desorb Time	1 min
Syringe Flush Time	0
Sample Volume	7 mL
Standard 2	Yes

Water Method	
Preheat Temp	N/A
Preheat Time	N/A
Purge Time	11 min
Desorb Time	1 min
Syringe Flush Time	2
Sample Volume	5 mL
Rinse Volume	5 mL
# Rinses	2
Standard 2	Yes

¶ 6.5 Tekmar Autosampler Procedures

6.5.1 The Tekmar 3000 and ALS 2016/2032 uses the following operating conditions:

Inlet Gas Pressure: Helium 80 PSI.

Purge pressure: 20 PSI.

Purge flow: 40 ml/min.

Vial Heating: Soils only at 40 °C.

6.5.2 Samples, standards and QC samples are placed into various positions in the autosampler, and these positions and sample identifications are logged into the sample analysis logbook and computer system.

6.5.3 Autosampler Method 4 is used to purge the sparger tubes and condition the glassware. Program the sequence for the proper schedule, and exit to the 'standby'. Press 'step to standby' twice to start the clean sequence. When all slots have been purged, install new or cleaned tubes onto each slots and tighten the nut snugly (do not overtight).

6.5.4 Method 1 is the sample analysis method, settings for Method 1 are defined in the previous sections. Load Method 1 to the memory and press 'bake' to bake the trap.

6.5.5 Reserve the first few slots for standard and QC samples. Prepare the standards, matrix spikes (MS), ICV, and LCS. Use reagent water as the medium; do not use tap water. Inject the desired spike into a 5 mL syringe. Transfer the contents into appropriate position.

6.5.6 Water sample loading procedures are in section 9.2. Soil sample loading procedures are in 9.3.

¶ 6.6 Daily instrument checklist

- Carrier gas pressure is normal
- Ion source vacuum: $3-7 \times 10^{-5}$ torr for system "C" at oven temperature 150 °C; $2-5 \times 10^{-6}$ torr for system "G" at oven temperature 150 °C.
- Clean spargers and bake the trap.

§ 7.0 Reagents and Standards

¶ 7.1 Reagents

Methanol	Optima grade (Fisher Scientific, Inc.)
Reagent water	Deionized water prepurged with nitrogen gas for at least one hour. It should be demonstrated to be free of analytes. At least one method blank should be performed for each batch of samples.
Internal standards	Fluorobenzene 1,4-dichlorobenzene-d4 Chlorobenzene-d5.
Surrogate standards	Dibromofluoromethane, Toluene-d8, 4-Bromofluorobenzene and 1,2-dichloroethane-d4.

¶ 7.2 Stock standard solutions

- 1.0 Internal standard stock solution: Fluorobenzene, Chlorobenzene-d5, 1,4-dichlorobenzene-d4. Purchased from UltraScientific, Cat. # STM 520, or other qualified vendors at 2500 µg/mL.
- 2.0 Surrogate standard stock solution: Dibromofluoromethane, Toluene-d8, 1,2-dichloroethane-d4, and 4-Bromofluorobenzene. Purchased from UltraScientific, Cat. # STM 530, or other qualified vendors at 2500 µg/mL.
- 3.0 Gas compound stock standard, purchased from UltraScientific, Cat. # DMV-544-1, or other qualified vendors at 2000 µg/mL.
- 4.0 Non-gas compound stock standard, purchased from UltraScientific, Cat. # DMV-589-1, or other qualified vendors at 2000 µg/mL.
- 5.0 Additional compounds, mostly water soluble compounds prepared in house, 5000 ug/ml in methanol, 22 components.
- 6.0 Matrix spike/LCS standard: At APCL, full spike at the level 4 of the initial calibration is used for SW8260. Use the same stock solutions for calibration. The LCS/MS spike standard is from a source other than the initial calibration standard.

The maximum life time for non-gas standards in 1 ml vials is 6 month or sooner if comparison with initial calibration curve or with check standards indicates a problem.

The maximum life time for gas standards in 1 ml vials is 1 month or sooner if comparison with initial calibration curve or with check standards indicates a problem.

¶ 7.3 Working standard solutions

From the stock standard solutions, make the following working standard solutions:

- 1.0 Internal standard working solution at 50 ug/ml in methanol: Fill about 40 mL of methanol into a 50 mL volumetric flask. Using a 1 mL syringe, accurately transfer 1.00 mL of the 2500 ppm internal stock standard into the flask, add methanol to the mark.
- 2.0 Surrogate standard working solution at 50 ug/ml in methanol: Fill about 40 mL of methanol into a 50 mL volumetric flask. Using a 1 mL syringe, accurately transfer 1.00 mL of the 2500 ppm surrogate stock standard into the flask, add methanol to the mark.
- 3.0 Surrogate/Internal standard working solution at 250 ug/ml in methanol: Fill about 6 mL of methanol into a 10 mL volumetric flask. Using a 1 mL syringe, accurately

transfer 1.00 mL of the 2500 ppm surrogate stock standard into the flask, than transfer 1.00 mL of the 2500 ppm internal standard into the flask. Add methanol to the mark. This standard is loaded to the "Standard 2" vial on the ARCHON, for SW5035 analysis. The instrument will automatically add 1 uL of the surrogate/internal standard to the sample before purge.

4.0 Gas/Non-gas/Surrogate standard working solution at 200 ug/ml in methanol: Fill about 6 mL of methanol into a 10 mL volumetric flask. Using a 1 mL syringe, accurately transfer 1.00 mL of the 2000 ppm gas, 1.0 mL of the 2000 ppm non-gas, 0.4 mL of the 5000 ppm add-22 and 0.80 mL of 2500 ppm surrogate stock standards into the 10 mL flask. Add methanol to the mark. The standards should be stored in several 1-mL screw-cap vials with minimum head space and kept in the freezer. This working standard is used to prepare calibration standards.

5.0 Gas/Non-gas standard working solution at 200 ug/ml in methanol: Fill about 6 mL of methanol into a 10 mL volumetric flask. Using a 1 mL syringe, accurately transfer 1.00 mL of the 2000 ppm gas, 1.0 mL of the 2000 ppm non-gas and 0.4 mL of the 5000 ppm add-22 surrogate stock standards into the 10 mL flask. Add methanol to the mark. The standards should be stored in several 1-mL screw-cap vials with minimum head space and kept in the freezer.

This working standard is used to prepare calibration standards for the closed-system purge and trap instrument 'X'.

The maximum life time for non-gas standards in 1 ml vials is 6 month or sooner if comparison with initial calibration curve or with check standards indicates a problem.

The maximum life time for gas standards in 1 ml vials is 1 week or sooner if comparison with initial calibration curve or with check standards indicates a problem.

§ 8.0 Calibrations

¶ 8.1 Initial calibration

8.1.1 Prior to use, condition trap daily for 10 min while backflushing at 260 °C with the column at 200 °C .

8.1.2 Each GC/MS system must be hardware-tuned to meet the criteria in Table 4 of EPA 8260B by purging 50 ng of 4-bromofluorobenzene(BFB) into the GC/MS system.

(Table 4 can be found at the end of this SOP). Load 25 mL of 2 ppb of BFB into the sparger. Analyses must not begin until these criteria are met. For systems "G" and "Q", load 25 ml of 2ppb of BFB into the sparger. For systems "C" and "X", load 5 ml of 10 ppb of 4-BFB standard into the sparger. Analyses must not begin until these criteria are met.

8.1.3 For system "C" and "X", prepare six calibration standard solutions at nominal concentrations of 2 ppb, 10 ppb, 50 ppb, 80 ppb, 100, and 200 ppb.

For systems "Q" and "G", prepare six calibration standard solutions at nominal concentrations of 0.3 ppb 2 ppb, 10 ppb, 20 ppb, 40 ppb and 80 ppb.

The highest or the lowest calibration point can be dropped for some compounds if the calibration linearity can not meet method requirement. However, deleting the lowest point is only allowed if the subsequent calibration level is at or below the corresponding PQL.

Some compounds are slightly water soluble so their concentrations are higher than other compounds. Table 2 lists the calibration compounds with ratios to the nominal concentrations.

The calibration standards are prepared just before calibration using the calibration working standard and reagent water. The amount of working standard and reagent water is defined in Table 3. Volumetric flasks should be used for water volumes larger than 25 mL. If water volume less than 25 mL, 5 mL or 25 mL syringes can be used.

Since the calibration standards are prepared in water solution, they should be loaded onto the autosampler immediately after preparation.

Table 3 and 4 list the amount of each standard needed for each level of calibration points and how they are prepared:

Table 2 Compounds in the calibration solution

No.	Name	Ratio to Nominal
1	Acetone	10
2	Acrolein	10
3	Acetonitril	10
4	Acrylonitrile	10
5	Benzene	1
6	Benzyl chloride	1
7	Bromobenzene	1
8	Bromochloromethane	1
9	Bromodichloromethane	1
10	Bromoform	1
11	Bromomethane	1
12	2-Butanone (MEK)	10
13	n-Butylbenzene	1
14	sec-Butylbenzene	1
15	tert-Butylbenzene	1
16	Carbon disulfide	1
17	Carbon tetrachloride	1
18	Chlorobenzene	1
19	Chlorodibromomethane	1
20	Chloroethane	1
21	2-Chloroethyl vinyl ether	10
22	Chloroform	1
23	1-Chlorohexane	1
24	Chloromethane	1
25	2-Chlorotoluene	1
26	4-Chlorotoluene	1
27	1,2-Dibromo-3-chloropropane	1
28	1,2-Dibromoethane	1
29	Dibromomethane	1
30	1,2-Dichlorobenzene	1
31	1,3-Dichlorobenzene	1
32	1,4-Dichlorobenzene	1
33	1,4-dichlorobutene-2	1
34	Dichlorodifluoromethane	1
35	1,1-Dichloroethane	1
36	1,2-Dichloroethane	1
37	1,1-Dichloroethene	1
38	cis-1,2-Dichloroethene	1
39	trans-1,2-Dichloroethene	1
40	1,2-Dichloropropane	1

Table 2 Compounds in the calibration solution (continued)

No.	Name	Ratio to Nominal
41	1,3-Dichloropropane	1
42	2,2-Dichloropropane	1
43	1,1-Dichloropropene	1
44	cis-1,3-Dichloropropene	1
45	trans-1,3-Dichloropropene	1
46	Diethyl ether	5
47	Ethylbenzene	1
48	Ethyl methacrylate	1
49	F-113	1
50	Hexachlorobutadiene	1
51	2-Hexanone	5
52	Iodomethane	1
53	Isopropyl benzene	1
54	p-Isopropyltoluene	1
55	Methylene chloride	1
56	Methyl t-butyl ether (MTBE)	2
57	Methyl methacrylate	1
58	MIBK	1
59	Naphthalene	1
60	n-Propylbenzene	1
61	Styrene	1
62	1,1,1,2-Tetrachloroethane	1
63	1,1,2,2-Tetrachloroethane	1
64	Tetrachloroethene	1
65	Tetrahydrofuran	1
66	Thiophene	1
67	Toluene	1
68	1,2,3-Trichlorobenzene	1
69	1,2,4-Trichlorobenzene	1
70	1,1,1-Trichloroethane	1
71	1,1,2-Trichloroethane	1
72	Trichloroethene	1
73	Trichlorofluoromethane	1
74	1,2,3-Trichloropropane	1
75	1,2,4-Trimethylbenzene	1
76	1,3,5-Trimethylbenzene	1
77	Vinyl chloride	1
78	Vinyl acetate	5
79	o-Xylene	1
80	m/p-Xylene	1

Table 3A. Calibration Standard Preparation for 5 mL Purge Volume
Instruments: C and Q

Level	Concentration ($\mu\text{g/L}$)	I.S. Amount (50 $\mu\text{g/mL}$)	Gas/non-gas/Surrogate (200 $\mu\text{g/mL}$)
1	2	5 μL into 5mL	1 μL to 100mL
2	10	5 μL into 5mL	5 μL to 100mL
3	50	5 μL into 5mL	6.25 μL to 25mL
4	80	5 μL into 5mL	10 μL to 25mL
5	100	5 μL into 5mL	12.5 μL to 25mL
6	200	5 μL into 5mL	5 μL to 5mL

Table 3B. Calibration Standard Preparation for Closed-System P&T
5 mL volume, Instrument: X

Level	Concentration ($\mu\text{g/L}$)	I.S./Surr Amount (250 $\mu\text{g/mL}$)	Gas/Non-gas (200 $\mu\text{g/mL}$)
1	2	1 μL into 5mL (Auto)	1 μL to 100mL
2	10	1 μL into 5mL (Auto)	5 μL to 100mL
3	50	1 μL into 5mL (Auto)	6.25 μL to 25mL
4	80	1 μL into 5mL (Auto)	10 μL to 25mL
5	100	1 μL into 5mL (Auto)	12.5 μL to 25mL
6	200	1 μL into 5mL (Auto)	5 μL to 5mL

Table 4. Calibration Standard Preparation for 25 mL Purge Volume
Instrument: G

Level	Concentration ($\mu\text{g/L}$)	I.S. Amount (50 $\mu\text{g/mL}$)	Gas/Non-gas/Surrogate (200 $\mu\text{g/mL}$)
1	0.3	5 μL into 25mL	1.5 μL to 1000mL
2	2	5 μL into 25mL	1 μL to 100mL
3	10	5 μL into 25mL	5 μL to 100mL
4	20	5 μL into 25mL	2.5 μL to 25mL
5	40	5 μL into 25mL	5 μL to 25mL
6	80	5 μL into 25mL	10 μL to 25mL

8.1.4 Edit a sequence in the Chemstation software which corresponds the the sequence in the Tekmar ASC 3000 and start purge-and-trap procedure.

8.1.5 Tabulate the area response of the characteristic ions against concentration for each compound and each internal standard. Calculate response factors (RF) for each compound relative to one of the internal standards. The internal standard selected

for the calculation of the RF for a compound should be the internal standard that has a retention time closest to the compound being measured. The RF is calculated as follows:

$$RF = \frac{A_x C_{is}}{A_{is} C_x}$$

where:

A_x = Area of the characteristic ion for the compound being measured.

A_{is} = Area of the characteristic ion for the specific internal standard.

C_{is} = Concentration of the specific internal standard.

C_x = Concentration of the compound being measured.

8.1.6 The Chemstation is capable of generating individual RF's and the average RF for each compound. A system performance check should be made before at this point. Five compounds (the System Performance Check Compounds, or SPCCs) are checked for a minimum average response factor. These compounds are chloromethane, 1,1-dichloroethane, bromoform, 1,1,2,2-tetrachloroethane, and chlorobenzene. The minimum acceptable average RFs for chloromethane, 1,1-dichloroethane, bromoform are 0.10, for 1,1,2,2-tetrachloroethane, and chlorobenzene are 0.3.

8.1.7 The software also calculates the percent relative standard deviation (%RSD).

$$\%RSD = SD \times 100/\bar{X}$$

where:

RSD = relative standard deviation.

\bar{X} = mean of initial RFs for a compound.

SD = standard deviation of average RFs for a compound.

The percent relative standard deviation should be less than 15% for each compound. However, the %RSD for each individual Calibration Check Compounds (CCCs) be less than 30%. This criterion must be met in order for the individual calibration to be valid. The CCCs are: 1,1-Dichloroethene, Chloroform, 1,2-Dichloropropane, Toluene, Ethylbenzene, and Vinyl chloride.

8.1.8 Linearity - If the %RSD of any compound is 15% or less, then the relative response factor is assumed to be constant over the calibration range, and the average relative

response factor may be used for quantitation.

If the %RSD of any compound is greater than 15%, then first order of regression fit of the six points can be used. The correlation coefficient of the regression (r^2) must be greater than or equal to 0.99.

§ 9.0 Procedures for sample analysis

¶ 9.1 Daily GC/MS calibration

9.1.1 Prior to the analysis of samples, purge 50-ng of the 4-bromofluorobenzene standard.

The resultant mass spectra for the BFB must meet all of the criteria given in Table 4 of EPA 8260B before sample analysis begins. (Table 4 can be found at the end of this SOP). These criteria must be demonstrated each 12-hr shift.

9.1.2 The initial calibration curve for each compound of interest must be checked and verified once every 12 hrs of analysis time. This is accomplished by analyzing a 50 ug/L calibration standard. Then check the SPCC (Paragraph 8.1.6) and CCC (Paragraph 8.1.7). This is the same check that is applied during the initial calibration.

If the minimum response factors are not met, the system must be evaluated, and corrective action must be taken before sample analysis begins. The minimum acceptable average RFs for chloromethane, 1,1-dichloroethane, bromoform are 0.10, for 1,1,2,2-tetrachloroethane, and chlorobenzene are 0.30. Some possible problems are standard mixture degradation, injection port inlet contamination, contamination at the front end of the analytical column, and active sites in the column or chromatographic system.

Calculate the percent difference when performing the average response factor model calibration. Use percent drift when calibrating using a regression fit model.

If the percent difference or drift for each CCC is less than 20%, the initial calibration is assumed to be valid. If the criterion is not met (greater than 20% difference), for any one CCC, corrective action **MUST** be taken. Problems similar to those listed under SPCCs could affect this criterion. If no source of the problem can be determined after corrective action has been taken, a new five-point calibration **MUST** be generated. This criterion **MUST** be met before quantitative sample analysis begins.

Alternatively, if the CCC and SPCC criteria have been met, however, %Difference or %drift for some compounds are over 15%, the CCV may still be acceptable if the following conditions are met as specified in Method 8000B: if the average of the %difference or %drift

for all analytes are within 15%, then the calibration has been verified. If this approach is not acceptable for a particular project objective, then project specific acceptance criteria and corresponding corrective action should be used.

9.1.3 The internal standard responses and retention times in the calibration standard must be evaluated immediately after or during data acquisition. If the retention time for any internal standard changes by more than 30 sec from the last check calibration (12hr), the chromatographic system must be inspected for malfunctions and corrections must be made, as required. If the extracted ion current profile (EICP) area for any of the internal standards changes by a factor of two (-50% to +100%) from the last daily calibration standard check, the mass spectrometer must be inspected for malfunctions. After the necessary corrections have been made, samples analyzed during the malfunctioning should be re-analyzed.

¶ 9.2 Water sample analysis

9.2.1 If necessary, screen samples prior to purge-and-trap analysis using GC equipped with FID/PID to prevent from contamination of the purge-and-trap system.

9.2.2 Allow sample to warm to ambient temperature before analysis.

9.2.3 Set up the GC/MS system and the purge and trap system as outlined in Section 6.

9.2.4 Do BFB tuning and daily GC/MS calibration. Both criteria must be met before analyzing samples.

9.2.5 Remove the plunger from a 5-mL syringe and attach a closed syringe valve. Open the sample or standard bottle, which has been allowed to come to ambient temperature, and carefully pour the sample into the syringe barrel to just short of overflowing. Replace the syringe plunger and compress the sample. Open the syringe valve and vent any residual air while adjusting the sample volume to 5.0 mL.

9.2.6 Add 5 ul 50 ug/ml internal standard and 5 ul 50 ug/ml surrogate standard solution to the sample.

9.2.7 Load the whole content in the syringe into the sparger. The above procedure is for 5 ml sparger autosampler in systems "C" and "Q". For system "G" where 25 ml spargers are installed, follow the same procedure except the sample volume is 25 ml.

9.2.8 For water samples which require dilution, use an appropriate syringe to withdraw a certain amount of sample, inject it into a 5 mL or 25 mL syringe filled with reagent water. Add internal standard and surrogate standard as in 9.2.6. Load the whole

content into the sparger.

9.2.9 Edit a sequence in autosampler and in GC/MS, execute the purge sequence to start analysis.

¶ 9.3 Soil Sample analysis

9.3.1 Use a 5 g sample if the expected concentration is <0.1 mg/kg or a 0.5 g sample for expected concentrations between 0.1 and 1 mg/kg.

9.3.2 Load 5 ml of reagent water containing 50 ppb of internal standard and surrogates to the spargers using the 50 ppm internal/surrogate working standards.

9.3.3 Heat the sample to 40 ± 1 °C.

9.3.4 Edit a sequence in autosampler and in GC/MS, execute the purge sequence to start analysis.

9.3.5 The analysis of highly contaminated soil samples should be extracted or diluted with methanol. For sediment/soil and solid wastes that are insoluble in methanol, weigh 4 g of sample into a 40 ml vial. Record the weight to 0.1 gram. For waste that is soluble in methanol or PEG, weigh 4 g to a 10 ml vial. Quickly add 10.0 ml of methanol. Cap and shake for 2 minutes.

9.3.6 Take an appropriate amount of the methanol extract (not more than 0.1 ml) and add to the 5 ml syringe containing 5 ml reagent water.

9.3.7 To the syringe add 5 ul of internal standard and 5 ul surrogate standard.

9.3.8 Edit a sequence in autosampler and in GC/MS, execute the purge sequence to start analysis.

¶ 9.4 Low level soil sample analysis using SW5035, soil samples in the coring device:

9.4.1 Rinse the VOA vial three times with 3 x 20 mL reagent water. Add 5 mL of reagent water into a clean 40 mL VOA vial.

9.4.2 Open the coring device and push the soil into the VOA vial and cap the vial. This step should be done as quick as possible (within 5 seconds).

9.4.3 Label the vial on the outside using a marker. Load the labeled vial on the ARCHON tray. The ARCHON can only run samples sequentially, so place all samples sequentially on the tray.

9.4.4 For MS/MSD or LCS, instead of adding 5 mL reagent water into the VOA vial, add 5 mL of water containing 50 ppb of spiking compounds. See Table 3B for preparation

of the standard solution.

- 9.4.5 Record the sample weight on the logbook. The sample weights may be found on the label or the chain-of-custody.
- 9.4.6 Choose the soil method, input the start and end position of the samples to be analyzed. Make sure the sequence matches the samples in the tray.
- 9.4.7 Edit a sequence in the computer that matches the sequence of ARCHON.
- 9.4.8 Press "Start" to analyze the samples.

¶ 9.5 Low level soil sample analysis using SW5035, soil samples in the VOA vial

- 9.5.1 Soils samples in the VOA vial contain 5 mL of sodium bisulfate solution.
- 9.5.2 Record the sample weight on the logbook. The sample weights may be found on the label or the chain-of-custody.
- 9.5.3 Load the vials on the ARCHON tray. The ARCHON can only run samples sequentially, so place all samples sequentially on the tray.
- 9.5.4 Choose the soil method, input the start and end position of the samples to be analyzed. Make sure the sequence matches the samples in the tray.
- 9.5.5 Edit a sequence in the computer that matches the sequence of ARCHON.
- 9.5.6 Press "Start" to analyze the samples.

¶ 9.6 Medium level soil sample analysis using SW5035

Medium level samples can be analyzed by any instruments using water sample calibration curves.

- 9.6.1 Push the soil samples into a VOA vial containing 10 mL of methanol. Record the sample weight on the logbook. The sample weights may be found on the label or the chain-of-custody. Cap and shake for 2 minutes.
- 9.6.2 Take an appropriate amount of the methanol extract (not more than 0.1 ml) and add to the 5 ml syringe containing 5 ml reagent water.
- 9.6.3 To the syringe add 5 ul of internal standard and 5 ul surrogate standard. For ARCHON, skip this step. The instrument will add internal standards and surrogates automatically.
- 9.6.4 Edit a sequence in autosampler and in GC/MS, execute the purge sequence to start analysis.

§ 10 Data Interpretation:

¶ 10.1 Qualitative analysis:

10.1.1 An analyte is identified by comparison of the sample mass spectrum with the mass spectrum of a standard of the suspected compound (standard reference spectrum). These standard reference spectra is obtained through analysis of the calibration standards and confirmed by software library. The following criteria must be satisfied to verify identification:

- (1) The intensities of the characteristic ions of a compound maximize in the same scan or within on scan of each other.
- (2) elution of sample component(RRT) is within ± 0.06 RRT units of of the standard component.
- (3) By visual comparison, the relative intensities of the characteristic ions should be close to the relative intensities of these ions in the reference spectrum.

10.2 For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. Guidelines for making tentative identification are:

- (1) All ions present in the standard mass spectra at a relative intensity greater than 10% (most abundant ion in the spectrum equals 100%) must be present in the sample spectrum).
- (2) By visual comparison, the relative intensities of ions specified in (1) must be similar between the standard and sample spectra.
- (3) Molecular ions present in the reference spectrum should be present in the sample spectrum.
- (4) Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of coeluting compounds.
- (5) Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or coeluting peaks. Data system library reduction programs can sometimes create these discrepancies.

10.3 Special attention should be given to the following compounds because they have

the same target ion and qualifier ion (most are isomers) and their RTs are also very close.

- 1 Ethylbenzene and m/p xylene
- 2 1,3-Dichlorobenzene and 1,4-dichlorobenzene.
- 3 Dichlorodifluoromethane and chlorodifluoromethane.
- 4 MEK and hexane.

§ 11.0 Quantitative Analysis

- 11.1 When a compound has been identified, the quantification of that compound will be based on the integrated abundance from the EICP of the primary characteristic ion. Quantification will take place using the internal standard technique.
- 11.2 When linearity exists, calculate the concentration of each identified analyte in the sample as follows:

$$\text{ppb Analyte} = \frac{A_x}{A_{is}} \frac{I_s}{RF V_0}$$

where:

- A_x = Area of characteristic ion for the compound being measured.
- I_s = Amount of internal standard injected (ng).
- A_{is} = Area of characteristic ion for the internal standard.
- RF = Average Response factor for the compound, from initial calibration.
- V_0 = Sample volume (mL) or weight (g), taking into consideration any dilution made.

- 11.3 Alternatively, the regression line fitted to the initial calibration may be used for determination of analyte concentration.
- 11.4 Where applicable, an estimate of concentration for noncalibrated components in the sample should be made. The formulas given above should be used with the following modifications: The areas A_x and A_{is} should be from the total ion chromatograms and the RF for the compound should be reported indicating (1) that the value is an estimate and (2) which internal standard was used to determine its concentration. Use the nearest internal standard free of interferences.
- 11.5 To get correct peak areas, a set of proper integration parameters should be used. Either RTE or regular integration method could be utilized. In principle, a spe-

cial integration file can be assigned to both the target and qualifier ions for each compound.

§ 12 QA/QC requirements

¶ 12.1 QC samples

BFB tune, SPCC check, and CCC check should be performed every 12 hours. Method blank (MB), matrix spike (MS), matrix spike duplicate (MSD) and laboratory control spikes (LCS) should be analyzed on a daily basis or with each analytical batch. The internal standard and surrogate standards that are spiked into the sample also serve the purpose of monitoring each analysis.

¶ 12.2 QC limits

- BFB tune, SPCC, and CCC should all meet the criteria.
- All Control Limits including MDL, PQL(EQL), CCV, MS, MSD, LCS, LCSD, RPD etc of this method for different sample matrices are given in the latest version of *APCL Technical Handbook, Vol. II*.
- If the method blank (or instrument blank) indicates a result higher than MDL, the containers, reagents, and analytical system should be carefully examined and cleaned until the background disappears before samples can be analyzed.
- If CCV is out of the control limit, re-perform the CCV. If CCV is still out of the control limit, perform a new initial calibration.
- If recoveries of LCS or LCSD are outside the acceptable range, carefully examine the analysis process and correct any problems that may have occurred and re-analyze the associated sample batch.
- If there are not enough samples for MSD or even for MS, LCS/LCSD may be used for the QC report.
- If one of the recoveries for MS and MSD is out of the control limit, check the average for MS and MSD and RPD of MS/MSD. If both the average and RPD value are within the control limit, the results are acceptable. If the average of MS and MSD is also out of control and the RPD is within the control limit, the results are acceptable and flagged as "certain matrix interference", otherwise re-perform one more matrix spike.

- If recoveries of MS and MSD are outside the required range, check the recoveries of LCS. If LCS recoveries are reasonable, matrix interference is suspect; otherwise re-analyze the associated sample batch.
- If the surrogate recovery is outside the acceptable range, repeat sample analysis, if surrogate recovery still outside the range, reextract the sample or flag the data as "estimated concentration."
- If internal standards are used, all internal standard area counts in the sample must be fall in the range of 50% to 200% of the area in the most recent continuing calibration. If the requirement is not met, re-analyze the sample once; if the area count is still outside the range, matrix interference is suspect.

¶ 12.4 Reporting units

Use ug/L and ug/kg, respectively, for water and soil samples.

¶ 12.5 Reporting limits

The practical quantitation limits (PQL) of volatile organics are 5-10 $\mu\text{g/L}$ for liquid sample and 5-10 $\mu\text{g/kg}$ for soil samples. PQL for water soluble organics are 50-100 mg/L for liquid samples and 50-100 $\mu\text{g/kg}$ for soil samples. For contaminated water and soil, the PQL will be increased according to the dilution factors. Details of PQL is listed in APCL Quality Assurance Program Plan.

¶ 12.6 Significant figures and reporting values below PQLs

Calculations should utilize all available digits of precision, but final reported concentrations should be rounded to an appropriate number of significant figures (one digit of uncertainty). Experience indicates that three significant figures may be used. Values that are below PQLs are normally not reported unless they are specifically requested by clients.

§ 13.0 Record keeping and storage

All raw data, such as chain of custody, sample preparation record, analysis logbook and the analytical data, etc. will be kept in a file for a minimum of five years from the date the report was sent to the client. The analytical data is archived on magnetic tape and are available for the client if requested.

§ 14.0 References

- (1) EPA method 8260B, Revision 2, December 1996.
- (2) EPA method 5035, December 1996.

Table 4 from SW8260B: BFB Mass Internal Criteria

m/z	Required Intensity (relative abundance)
50	15 to 40% of m/z 95
75	30 to 60% of m/z 95
95	base peak, 100% relative abundance
96	5 to 9% of m/z 95
173	less than 2% of m/z 174
174	greater than 50% of m/z 95
175	5 to 9% of m/z 174
176	greater than 85% but less than 101% of m/z 174
177	5 to 9% of m/z 176

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Organic MDL and RL

MDL and RL for Organic Analysis

Ver. 10.00

February 16, 2001

Methd	#	Item name	Method Detection Limit (MDL)			Report Limit (RL)			
			DW $\mu\text{g/L}$	WW $\mu\text{g/L}$	LS $\mu\text{g/kg}$	DW $\mu\text{g/L}$	WW $\mu\text{g/L}$	LS $\mu\text{g/kg}$	HS $\mu\text{g/kg}$
8260(X)	1	Benzene	-	0.11	0.14	-	5	5	5F
	2	Bromobenzene	-	0.20	0.32	-	5	5	5F
	3	Bromochloromethane	-	0.38	0.46	-	5	5	5F
	4	Bromodichloromethane	-	0.059	0.18	-	5	5	5F
	5	Bromoform	-	0.29	0.28	-	5	5	5F
	6	Bromomethane	-	0.38	0.51	-	5	5	5F
	7	n-Butylbenzene	-	0.42	0.40	-	5	5	5F
	8	sec-Butylbenzene	-	0.28	0.44	-	5	5	5F
	9	tert-Butylbenzene	-	0.42	0.64	-	5	5	5F
	10	Carbon Tetrachloride	-	0.13	0.15	-	5	5	5F
	11	Chlorobenzene	-	0.15	0.17	-	5	5	5F
	12	Chloroethane	-	0.38	0.22	-	5	5	5F
	13	Chloroform	-	0.11	0.12	-	5	5	5F
	14	Chloromethane	-	0.13	0.12	-	5	5	5F
	15	2-Chlorotoluene	-	0.23	0.21	-	5	5	5F
	16	4-Chlorotoluene	-	0.27	0.39	-	5	5	5F
	17	Dibromochloromethane	-	0.18	0.081	-	5	5	5F
	18	1,2-Dibromo-3-Chloropropane	-	1.6	0.87	-	5	5	5F
	19	1,2-Dibromoethane	-	0.28	0.19	-	5	5	5F
	20	Dibromomethane	-	0.25	0.21	-	5	5	5F
	21	1,2-Dichlorobenzene	-	0.21	0.19	-	5	5	5F
	22	1,3-Dichlorobenzene	-	0.17	0.22	-	5	5	5F
	23	1,4-Dichlorobenzene	-	0.24	0.18	-	5	5	5F
	24	Dichlorodifluoromethane	-	0.20	0.27	-	5	5	5F
	25	1,1-Dichloroethane	-	0.11	0.12	-	5	5	5F
	26	1,2-Dichloroethane	-	0.12	0.17	-	5	5	5F
	27	1,1-Dichloroethene	-	0.12	0.083	-	5	5	5F
	28	cis-1,2-Dichloroethene	-	0.17	0.18	-	5	5	5F
	29	trans-1,2-Dichloroethene	-	0.17	0.12	-	5	5	5F
	30	1,2-Dichloropropane	-	0.15	0.18	-	5	5	5F
	31	1,3-Dichloropropane	-	0.11	0.11	-	5	5	5F
	32	2,2-Dichloropropane	-	0.18	0.11	-	5	5	5F
	33	1,1-Dichloropropene	-	0.15	0.13	-	5	5	5F
	34	cis-1,3-Dichloropropene	-	0.11	0.081	-	5	5	5F
	35	trans-1,3-Dichloropropene	-	0.12	0.14	-	5	5	5F

F is the ratio of the actual total dilution factor of the samples to the default total dilution factor of the method.

DW - Drinking water; WW - Waste water; LS - Low-level contaminated soil; HS - High-level contaminated soil.

The number in [] is the DLR on the California Title 22 Form.

ANINS000294

Applied P & Ch Laboratory

13760 Magnolia Ave. Chino CA 91710

Tel: (909) 590-1828 Fax: (909) 590-1498

Organic MDL and RL

MDL and RL for Organic Analysis

Ver. 10.00

February 18, 2001

Methd	#	Item name	Method Detection Limit (MDL)			Report Limit (RL)			
			DW $\mu\text{g/L}$	WW $\mu\text{g/L}$	LS $\mu\text{g/kg}$	DW $\mu\text{g/L}$	WW $\mu\text{g/L}$	LS $\mu\text{g/kg}$	HS $\mu\text{g/kg}$
8260(X)	36	Ethylbenzene	-	0.16	0.18	-	5	5	5F
	37	Hexachlorobutadiene	-	0.28	0.60	-	5	5	5F
	38	Isopropylbenzene	-	0.21	0.28	-	5	5	5F
	39	4-Isopropyltoluene	-	0.27	0.49	-	5	5	5F
	40	Methylene Chloride	-	0.39	0.25	-	5	5	5F
	41	Naphthalene	-	0.24	0.22	-	5	5	5F
	42	Propylbenzene	-	0.28	0.35	-	5	5	5F
	43	Styrene	-	0.13	0.11	-	5	5	5F
	44	1,1,1,2-Tetrachloroethane	-	0.51	0.71	-	5	5	5F
	45	1,1,2,2-Tetrachloroethane	-	0.17	0.17	-	5	5	5F
	46	Tetrachloroethene	-	0.28	0.18	-	5	5	5F
	47	Toluene	-	0.098	0.13	-	5	5	5F
	48	1,2,3-Trichlorobenzene	-	0.30	0.20	-	5	5	5F
	49	1,2,4-Trichlorobenzene	-	0.41	0.18	-	5	5	5F
	50	1,1,1-Trichloroethane	-	0.080	0.098	-	5	5	5F
	51	1,1,2-Trichloroethane	-	0.24	0.18	-	5	5	5F
	52	Trichloroethene	-	0.070	0.13	-	5	5	5F
	52	Trichlorofluoromethane	-	0.13	0.14	-	5	5	5F
	54	1,2,3-Trichloropropane	-	0.82	0.58	-	5	5	5F
	55	1,2,4-Trimethylbenzene	-	0.21	0.24	-	5	5	5F
	56	1,3,5-Trimethylbenzene	-	0.29	0.21	-	5	5	5F
	57	Vinyl Chloride	-	0.23	0.12	-	5	5	5F
	58	o-Xylene	-	0.12	0.20	-	5	5	5F
	59	m,p-Xylene	-	0.28	0.33	-	5	5	5F
	60	F113	-	0.15	0.15	-	5	5	5F
	61	MTBE	-	0.12	0.047	-	5	5	5F
	62	Tetrahydrofuran	-	5.8	2.4	-	50	50	-

F is the ratio of the actual total dilution factor of the samples to the default total dilution factor of the method.
 DW - Drinking water; WW - Waste water; LS - Low-level contaminated soil; HS - High-level contaminated soil.

The number in [] is the DLR on the California Title 22 Form.

Filename of this table: [apcl.qaqc.pql.v10]8260.tex

ANINS000295

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Organic MDL and RL

MDL and RL for Organic Analysis

Var. 10.00

February 16, 2001

Methd	#	Item name	Method Detection Limit (MDL)			Report Limit (RL)			
			DW $\mu\text{g/L}$	WW $\mu\text{g/L}$	LS $\mu\text{g/kg}$	DW $\mu\text{g/L}$	WW $\mu\text{g/L}$	LS $\mu\text{g/kg}$	HS $\mu\text{g/kg}$
#260 Additional(X)	1	Acetone	-	5.9	2.8	-	100	100	100F
	2	Acrolein	-	20	20	-	100	100	100F
	3	Acrylonitrile	-	2.0	1.8	-	50	50	50F
	4	2-Butanone (MEK)	-	4.0	1.8	-	50	50	50F
	5	Carbon disulfide	-	0.066	0.12	-	5	5	5F
	6	2-Chloroethyl vinyl Ether	-	1.4	1.4	-	50	50	50F
	7	Ethyl methacrylate	-	1.0	0.70	-	10	10	10F
	8	2-Hexanone	-	1.1	0.68	-	50	50	50F
	9	Iodomethane	-	0.90	0.44	-	5	5	5F
	10	4-Methyl-2-pentanone	-	0.31	0.15	-	50	50	50F
	11	Vinyl acetate	-	0.38	0.51	-	50	50	50F
	12	Ethyl acetate	-	0.29	0.30	-	50	50	50F
	13	Diethyl ether	-	1.39	0.38	-	50	50	50F
	14	MTBE	-	0.12	0.047	-	5	5	5F
	15	ETHYL-t-Butyl Ether(ETBE)	-	0.11	0.13	-	5	5	5F
	16	T-Amyl Methyl Ether(TAME)	-	0.089	0.13	-	5	5	5F
	17	T-Butyl Alcohol(TBA)	-	2.0	3.0	-	20	20	20F
	18	Diisopropyl Ether(DIPE)	-	0.099	0.11	-	5	5	5F

F is the ratio of the actual total dilution factor of the samples to the default total dilution factor of the method.

DW - Drinking water; WW - Waste water; LS - Low-level contaminated soil; HS - High-level contaminated soil.

Proposed by  (Supervisor)

ANINS000296

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Organic Control Limit: SW-846

Control Limit for EPA-600/8000 (SW-846)

Ver. 10.00

February 16, 2001

EPA Mthod	QC Type	Component Item name	Matrix Spike (MS) Control Limit				LCS Control Limit			
			Water Matrix		Soil Matrix		Water Matrix		Soil Matrix	
			Rec. %	RPD %	Rec. %	RPD %	Rec. %	RPD %	Rec. %	RPD %
624/8240	Surr.	1. 1,2-Dichloroethane-d4	77-124 [76-114]	-	70-128 [70-121]	-	-	-	-	-
		2. Toluene-d8	77-122 [88-110]	-	70-123 [81-117]	-	-	-	-	-
		3. BFB	75-121 [86-115]	-	74-122 [74-121]	-	-	-	-	-
	Spike	1. 11-di-Cl-ethene	73-126 [D-234]	26	65-129	32	77-123	26	70-125	32
		2. Trichloroethene	70-129 [71-157]	30	66-132	33	72-127	30	72-127	33
		3. Chlorobenzene	70-129 [37-150]	30	74-122	24	70-129	30	74-122	24
		4. Toluene	70-129 [47-150]	30	66-122	28	70-128	30	72-116	28
		5. Benzene	70-125 [37-151]	28	74-118	22	70-123	28	76-116	22
	Surr.	1. 1,2-Dichloroethane-d4	77-124 [80-120]	-	70-128 [80-120]	-	-	-	-	-
		2. Toluene-d8	77-122 [88-110]	-	70-123 [81-117]	-	-	-	-	-
		3. BFB	75-121 [86-115]	-	74-122 [74-121]	-	-	-	-	-
		4. Di-Br-F-methane	77-124 [86-118]	-	72-129 [80-120]	-	-	-	-	-
625/8270	Surr.	1. Nitrobenzene-d5	41-133 [33-114]	-	41-133 [23-120]	-	-	-	-	-
		2. 2-Fluoro-biphenyl	36-129 [43-114]	-	41-133 [30-115]	-	-	-	-	-
		3. Terphenyl-d14	45-134 [33-141]	-	45-134 [14-157]	-	-	-	-	-
		4. Phenol-d6	10-119 [10-94]	-	20-134 [24-113]	-	-	-	-	-
		5. 2-Fluorophenol	27-106 [21-100]	-	10-129 [23-121]	-	-	-	-	-
		6. 246-Tribromophenol	20-129 [10-125]	-	20-128 [10-127]	-	-	-	-	-
	Spike	1. Phenol	10-110 [5-112]	50	20-119	50	15-117	50	20-114	50
		2. 2-Chlorophenol	35-118 [23-134]	42	30-119	44	40-113	42	39-112	44
		3. 1,4-Dichlorobenzene	35-118 [20-124]	42	40-119	40	40-118	42	38-113	40
		4. N-Nitrosodi-n-Propylamine	40-133 [D-230]	47	40-133	47	40-130	47	40-125	47
		5. 1,2,4-Trichlorobenzene	40-133 [44-142]	47	40-130	45	40-113	47	39-114	45
		6. 4-Chloro-3-Methylphenol	40-130 [22-147]	45	40-133	47	40-119	45	40-115	47
		7. Acenaphthene	40-134 [47-145]	47	40-134	47	40-129	47	38-127	47
		8. 4-Nitrophenol	16-148 [D-132]	66	23-145	61	35-105	66	31-143	61
		9. 2,4-Dinitrotoluene	40-133 [39-139]	47	40-134	47	40-127	47	40-122	47
		10. Pentachlorophenol	21-139 [14-174]	59	21-148	64	42-115	59	33-142	64
		11. Pyrene	40-128 [52-116]	44	40-134	47	40-112	44	40-127	47

The values in [] are from EPA methods

Proposed by  (Supervisor)

APCL MDL/RL/CL SW-846 8000 Ver. 10.00 February 16, 2001 File: [APCL.QAQC.PQL.v10]CL.10P0.TEX

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ANINS000297

HEALTH & SAFETY PLAN

**GREVE FINANCIAL SERVICES, INC.
8915 SORENSEN AVENUE
SANTA FE SPRINGS, CALIFORNIA**

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Figure 1	Route to Hospital from Site
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ATTACHMENTS

Attachment 1	Field Team Review Forms
Attachment 2	Tailgate Safety Meeting Form

1. HEALTH AND SAFETY PLAN

Blakely Environmental Investigations, Inc. (BEII), has established this site-specific Health and Safety Plan (HASP) as part of the work plan for all individuals engaged in field assessment activities at the Greve Financial Services, Inc. (Greve) property located at 8915 Sorensen Avenue, Santa Fe Springs, CA. The plan was developed in accordance with Title 8 of the California Code of Regulations (8 CCR). All site work shall be conducted in a safe manner and comply with EPA, state and local regulations, in particular OSHA 29 CFR, part 1910, the National Contingency Plan, and Title 8 of the Health and Safety Code. In addition, all site work will comply with BEII Corporate Health and Safety Program and all supporting Standard Operating Procedures. This HASP may be modified during actual field activities, if necessary, as more information and site-specific data is obtained.

Prior to any work on-site, an approved copy of this HASP (latest edition) shall be provided to all employees and subcontractors by the Project Manager. Each subcontractor will be responsible for providing their own HASP. At a minimum the subcontractors' HASP must meet the requirements of this HASP. Each subcontractor not covered by the BEII HASP must submit their own HASP to the DTSC for review prior to initiation of field work.

1.1 PURPOSE AND OBJECTIVES

The purpose of this site-specific HASP is to provide guidelines and procedures to ensure the health and physical safety of those persons working at the Greve property. While it may be impossible to eliminate all risks associated with site work, the goal is to provide precautionary and responsive measures for the protection of on-site personnel, the general public and the environment.

The HASP objectives are as follows:

- * Ensure the safety of all site personnel
- * Protect the public and the environment
- * Adhere to BEII Health and Safety procedures

1.2 IMPLEMENTATION

This site-specific HASP, and any additions included in a subcontractor HASP, will be reviewed and the Field Team Review Form (Attachment 1) will be completed by all site personnel prior to their scheduled field work.

Whenever the site-specific HASP is revised or amended, personnel will be instructed in the new procedures and required to complete a new Field Team Review Form. The site-specific HASP will be implemented in the field by BEII's Health and Safety Coordinator and/or designated Site Safety Officer.

2.0 BACKGROUND

2.1 SITE LOCATION AND DESCRIPTION

The site is located at 8915 Sorensen Avenue in Santa Fe Springs. The site was an operating chemical packaging facility. Petroleum hydrocarbon impacted soil and groundwater were identified at the site. Currently, the site is unoccupied.

2.2 SCOPE OF WORK

Perform quarterly groundwater monitoring.

3. RESPONSIBILITIES

3.1 HEALTH AND SAFETY COORDINATOR

As BEII's Health and Safety Coordinator (HSC), Dave Blakely is responsible for directing and implementing the HASP and ensuring that all BEII and subcontractor personnel have been trained in HASP procedures. The HSC will coordinate safety activities with subcontractors and serve as liaison with public officials who might wish to monitor health and safety activities on-site. The HSC will also ensure that proper protective equipment is available and used in the correct manner, that decontamination activities are carried out correctly, that specific site hazards are noted and accounted for in the Work Plan and that employees have knowledge of the local emergency medical system. The HSC may conduct periodic site audits to ensure compliance with the HASP and to note any additional hazards or concerns. The HSC has stop-work authorization, which shall be executed upon determination that an imminent health or safety hazard exists.

3.2 DESIGNATED SITE SAFETY OFFICER

As BEII's Site Safety Officer (SSO), James Jazmin is responsible for implementing the site-specific HASP in the absence of the HSC. The SSO shall conduct daily tailgate safety meetings and ensure that only authorized personnel are allowed at the site. In addition, the SSO shall ensure that the daily sign-in logs for site persons and visitors are maintained. The SSO shall report any unsafe acts or conditions to the HSC.

The SSO also has stop-work authorization, which shall be executed upon determination that an imminent danger to life or health exists. If a stop-work order is issued, due to safety concerns, the HSC shall be contacted immediately and appropriate steps taken to correct the situation.

3.3 PROJECT MANAGER

BEII Project Manager, Hiram Garcia is the direct link between BEII and the Greve. He is responsible for directing all on-site operations, including the overall implementation of the Health and Safety Program. In addition, the Project Manager is responsible for ensuring that adequate resources and personnel protective equipment are allocated for the health and safety of site personnel. The Project Manager is also responsible for ensuring that the safety personnel (via the HSC) are given free access to all relevant site information that could impact health and safety. He will correct conditions or work practices that could lead to employee exposure to hazardous materials.

3.4 OCCUPATIONAL MEDICAL CONSULTANT

SAN BERNARDINO COMMUNITY HOSPITAL, BEII's Occupational Medical Consultant, will be available to answer medical questions and provide guidance in unexpected situations. The Medical Consultant will recommend appropriate medical monitoring for the site team members.

3.5 EMPLOYEES

All BEII employees working at the site are responsible for reading and understanding the HASP. They will be held accountable for complying with all aspects of the HASP.

3.6 SUBCONTRACTORS

If they desire, subcontractors on the site may provide their own site Health and Safety Plan that must incorporate, at a minimum, BEII's Health and Safety Plan. As described above, BEII's HSC and SSO have authority to ensure that subcontractor employees are following the BEII and subcontractor HASP provisions.

4. EMERGENCY PLANNING

4.1 EMERGENCY SERVICES

Figure 1 illustrates the location of the Greve property with respect to the Hospital. If an emergency should occur on-site, the Emergency Medical System (911) should be activated.

4.2 EMERGENCY TELEPHONE NUMBERS

Emergency telephone numbers shall be posted on-site and made immediately available at all times. These numbers shall include the following:

EMERGENCY:

Fire	(562) 944-9713
Ambulance	911
Police	(562) 409-1850
Emergency Rooms (see Figure 1 for Hospital Routes)	
Presbyterian Intercommunity Hospital	(562) 945-8925
San Bernardino Community Hospital	(909) 988-9211
BEII (Dave Blakely)	(760) 249-5498
Greve Financial Services, Inc. (Joe Kennedy)	(310) 753-5770

NON-EMERGENCY:

City Fire Department	(562) 944-9713
City Police Department	(562) 409-1850
U.S. Environmental Protection Agency	(202) 260-2090
Emergency Spill Response	911

5. HAZARD ASSESSMENT

This hazard assessment is based on available information concerning chemical hazards known or suspected to be present at the Greve property. The potential risks to site workers are evaluated below.

5.1 CHEMICAL EXPOSURE

Site workers may be exposed to the components of gasoline and chlorinated solvents during field activities, including drilling, sampling and treatment operations. Potential exposure is to petroleum hydrocarbon-contaminated soil and water. A description of those suspected contaminants can be found in Table 1. The routes of exposure for hydrocarbons are ingestion, inhalation, skin absorption and eye or skin contact. Measures shall be taken to eliminate personnel exposure through the use of personal protection equipment when engineering controls are not feasible. Cal-OSHA and Fed-OSHA air monitoring action levels will be used to select the appropriate personal protective equipment (PPE) to be used at the site.

Table 1 - Chemical Properties of Suspected Contaminants

Chemical Name	Chemical Formula	CAS #	Incompatibilities	Description	LEL	UEL	Cal OSHA	Fed OSHA	ACGIH (TLV)	NIOSH REL	IDLH	Carcinogen
Benzene	C_6H_6	71-43-2	Strong oxidizers, many fluorides and perchlorates, nitric acid.	Colorless to light-yellow liquid with an aromatic odor. frz:42F bp:176F Flashp:12F.	1.2%	7.8%	1 ppm	5 ppm (15 min)	0.5 ppm	Ca TWA 0.1 ppm ST 1 ppm	500 ppm	Yes
1,1-DCA	C_2Cl_2	7572-29-4	Oxidizers, heat, shock.	Volatile oil with a disagreeable, sweetish odor. frz:-58 to 87F bp:90F(explodes).	~	~	none	none		Ca C 0.1 ppm	Ca [N.D.]	Yes
1,2-DCA	C_2Cl_2	7572-29-4	Oxidizers, heat, shock.	Volatile oil with a disagreeable, sweetish odor. frz:-58 to 87F bp:90F(explodes).	~	~	none	none		.1 ppm	Ca [N.D.]	Yes
1,1-DCE	$CH_2=CCl_2$	75-35-4	Aluminum, sunlight, air, copper, heat. [Note: Polymerization may occur if exposed to oxidizers, chlorosulfonic acid, nitric acid or oleum. Inhibitors such as the monomethyl ether of hydroquinone are added to prevent polymerization.]	Colorless liquid or gas (above 89F) with a mild, sweet, chloroform-like odor. frz:-189F bp:89F Flashp:-2F.	6.5%	15.5%	none	none		Ca	Ca [N.D.]	Yes
cis 1,2-DCE	$ClCH=CHCl$	540-59-0	Strong oxidizers, strong alkalis, potassium hydroxide, copper. [Note: Usually contains inhibitors to prevent polymerization.]	Colorless liquid with a slightly acid, chloroform-like odor. frz: 57 to -115F bp:118-140F Flashp:36-39F.	5.6%	12.8%	TWA 200 ppm	TWA 200 ppm		TWA 200 ppm	1000 ppm	No
trans 1,2-DCE	$ClCH=CHCl$	540-59-0	Strong oxidizers, strong alkalis, potassium hydroxide, copper. [Note: Usually contains inhibitors to prevent polymerization.]	Colorless liquid with a slightly acid, chloroform-like odor. frz:-57 to -115F bp:118-140F Flashp:36-39F.	5.6%	12.8%	TWA 200 ppm	TWA 200 ppm		TWA 200 ppm	1000 ppm	No
Ethylbenzene	$CH_3CH_2C_6H_5$	100-41-4	Strong oxidizers.	Colorless liquid with aromatic odor. frz:-139F bp:277F Flashp:56F.	0.8%	6.7%	TWA 100 ppm	TWA 100 ppm		TWA 100 ppm ST 125 ppm	800 ppm [10% LEL]	No
MEK	$CH_3COCH_2CH_3$	78-93-3	Strong oxidizers, amines, ammonia, inorganic acids, caustics, isocyanates, pyridines.	Colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor. frz:-123F bp:175F Flashp:16F.	1.4% (200F)	11.4% (200F)	TWA 200 ppm			TWA 200 ppm ST 300 ppm	3000 ppm	No

Table 1 - Chemical Properties of Suspected Contaminants (Continued)

Chemical Name	Chemical Formula	CAS #	Incompatibilities	Description	LEL	UEL	Cal OSHA	Fed OSHA	ACGIH (TLV)	NIOSH	IDLH	Carcinogen
Methylene Chloride	CH_2Cl_2	75-09-2	Strong oxidizers; caustics; chemically-active metals such as aluminum, magnesium powders, potassium, and sodium.	Colorless liquid with a chloroform-like odor. frz: -139F bp:104F	13.0%	23.0%	TWA 25 ppm ST 125 ppm			Ca	Ca 2300 ppm	Yes
PCE	$\text{Cl}_2\text{C}=\text{CCl}_2$	127-18-4	Strong oxidizers; chemically-active metals such as lithium, beryllium, and barium; caustic soda; sodium hydroxide; potash.	Colorless liquid with a mild, chloroform-like odor. frz: -2F bp:250F	NA	NA	TWA 100 ppm C 200 ppm 300 ppm (5 min. peak in any 3 hrs)			Ca Minimize workplace exposure concentrations	Ca [150 ppm]	Yes
1,1,1-TCA	CH_3CCl_3	71-55-6	Strong caustics; strong oxidizers; chemically-active metals such as zinc, aluminum, magnesium powders, sodium, and potassium; water. [Note: Reacts slowly with water to form hydrochloric acid.]	Colorless liquid with a mild, chloroform-like odor frz: -23F bp:165F	7.5%	12.5%	350 ppm	350 ppm	350 ppm	C 350 ppm [15-minute]	700 ppm	No
TCE	$\text{ClCH}=\text{CCl}_2$	79-01-6	Strong caustics and alkalis; chemically-active metals (such as barium, lithium, sodium, magnesium, titanium, and beryllium).	Colorless liquid (unless dyed blue) with a chloroform-like odor. frz: -99F bp:189F	8% (77F)	10.5% (77F)	TWA 100 ppm 200 ppm 300 ppm (5-min peak in any 2 hours)			Ca	Ca [1000 ppm]	Yes
Toluene	$\text{C}_6\text{H}_5\text{CH}_3$	108-88-3	Strong oxidizers.	Colorless liquid with a sweet, pungent, benzene-like odor. frz: -139F bp:232F Flashp:40F	1.10%	7.1%	50 ppm	200 ppm	50 ppm	TWA 50 ppm 200 ppm (10 min.)	500 ppm	No
Xylenes	C_8H_{10}	1330-20-7	Strong oxidizers, strong acids.	Colorless liquid with an aromatic odor. frz: 54 to 56F bp:281 to 292F Flashp:81 to 90F	0.9% to 1.1%	6.7% to 7.0%	TWA 100 ppm		100 ppm	TWA 100 ppm ST 150 ppm	900 ppm	No

Table 1 - Chemical Properties of Suspected Contaminants (continued)

Chemical Name	Routes of Exposure	Symptoms	Target Organs	Recommended Respirator Selection
Benzene	Inhalation, Skin adsorption, Ingestion, Skin/eye contact.	Irritated eyes, nose, respiratory system; giddy; headache; nausea; staggering gait; fatigue; anorexia; lassitude; dermatitis; bone marrow depressant; abdominal pain.	Blood, central nervous system, skin, bone marrow, eyes, respiratory system.	Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure demand mode at concentrations above NIOSH REL.
1,1-DCA	Inhalation, Skin adsorption, Ingestion, Skin/eye contact.	Headache; loss of appetite; nausea; vomiting; intense jaw pain; cranial nerve palsy.	Central nervous system.	Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure demand mode at concentrations above NIOSH REL.
1,2-DCA	Inhalation, Skin adsorption, Ingestion, Skin/eye contact.	Headache; loss of appetite; nausea; vomiting; intense jaw pain; cranial nerve palsy.	Central nervous system.	Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure demand mode at concentrations above NIOSH REL.
1,1-DCE	Inhalation, Skin adsorption, Ingestion, Skin/eye contact.	Irritated eyes, skin, throat; dizziness; headache; nausea; dyspnea; liver, kidney disturbance; pneumonitis.	Eyes, skin, respiratory system, central nervous system, liver, kidneys.	Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure demand mode at concentrations at any detectable level.
cis 1,2-DCE	Inhalation, Skin adsorption, Ingestion, Skin/eye contact.	Irritated eyes, respiratory system; central nervous system depression.	Eyes, respiratory system, central nervous system.	Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure demand mode at concentrations at up to 2000 ppm.
trans 1,2-DCE	Inhalation, Skin adsorption, Ingestion, Skin/eye contact.	Irritated eyes, respiratory system; central nervous system depression.	Eyes, respiratory system, central nervous system.	Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure demand mode at concentrations at up to 2000 ppm.
Ethylbenzene	Inhalation, Skin adsorption, Ingestion, Skin/eye contact.	Irritated eyes, skin, mucous membrane; headache; dermatitis; narcosis; coma.	Eyes, skin, respiratory system, central nervous system.	Any chemical cartridge respirator with organic vapor cartridges up to 800 ppm. Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure demand mode at concentrations above 800 ppm.
MEK	Inhalation, Skin adsorption, Ingestion, Skin/eye contact.	Irritated eyes, skin, nose; headache; dizziness; vomiting; dermatitis.	Eyes, skin, respiratory system, central nervous system.	Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure demand mode at concentrations at up to 3000 ppm.
Methylene Chloride	Inhalation, Skin adsorption, Ingestion, Skin/eye contact.	Irritated eyes, skin; lassitude; drowsiness; dizziness; numbness; tingling limbs; nausea.	Eyes, skin, cardiovascular system, central nervous system.	Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure demand mode at concentrations at any detectable level.
PCE	Inhalation, Skin adsorption, Ingestion, Skin/eye contact.	Irritated eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness; incoordination; headache; drowsiness; skin erythema; liver damage.	Eyes, skin, respiratory system, liver, kidneys, central nervous system.	Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure demand mode at concentrations above NIOSH REL.

Table 1 - Chemical Properties of Suspected Contaminants (Continued)

Chemical Name	Routes of Exposure	Symptoms	Target Organs	Recommended Respirator Selection
1,1,1-TCA	Inhalation, Skin adsorption, Ingestion, Skin/eye contact.	Irritated eyes, skin; headache; lassitude; central nervous system depression; poor equilibrium; dermatitis; cardiac arrhythmias; liver damage.	Eyes, skin, central nervous system, cardiovascular system, liver.	Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure demand mode at concentrations at up to 700 ppm.
TCE	Inhalation, Skin adsorption, Ingestion, Skin/eye contact.	Irritated eyes, skin; headache; visual disturbance; lassitude; dizziness; tremor; drowsiness; nausea; vomiting; dermatitis; cardiac arrhythmias; paresthesia; liver injury.	Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system.	Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure demand mode at concentrations at any detectable level.
Toluene	Inhalation, Skin adsorption, Ingestion, Skin/eye contact.	Irritated eyes, nose; lassitude; confusion; euphoria; dizziness; headache; dilated pupils; lacrimation; anxiety; muscle fatigue; insomnia; paresthesia; dermatitis liver, kidney damage.	Eyes, skin, respiratory system, central nervous system, liver, kidneys.	Any chemical cartridge respirator with organic vapor cartridges up to 500 ppm. Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure demand mode at concentrations above 500 ppm.
Xylenes	Inhalation, Skin adsorption, Ingestion, Skin/eye contact.	Irritated eyes, skin, nose, throat; dizziness; excitement; drowsiness; incoordination; staggering gait; corneal vacuolization; anorexia; nausea; vomiting; abdominal pain; dermatitis.	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys.	Any chemical cartridge respirator with organic vapor cartridges up to 500 ppm. Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure demand mode at concentrations above 900 ppm.

5.2 FIRE AND EXPLOSION

The risk of fire or explosion during site activities is present, though minimal. Toluene is considered flammable and is a known contaminant on-site. The lower explosive limits (LEL) for benzene, toluene and xylene are 1.3 to 1.4 percent, 1.2 percent and 1.1 percent, respectively. Their flash points are 12F, 40F and 81F, respectively.

For added security, smoking will not be allowed on the site except in a designated smoking area (to be determined). "No Smoking" signs will be prominently displayed at numerous locations. A portable combustible gas monitor may be utilized to monitor the LEL. All work will cease if the percent LEL reaches 10 percent.

5.3 OXYGEN DEFICIENCY

It is not expected that an oxygen-depleted atmosphere will be encountered during site activities. Whenever the risk of encountering an oxygen-depleted atmosphere does exist (confined space entry, for example), precautions will be taken to ensure the safety of all employees. Confined space entries are used only as a last resort, when all other means have been exhausted. BEII uses a special permit system for confined space entry, entailing additional employee training and atmospheric monitoring.

5.4 BIOLOGIC HAZARDS

It is not anticipated that poisonous plants or hazardous animals will be encountered during site activities.

5.5 SAFETY HAZARDS

Minimal safety hazards are expected onsite. All work will be performed during daylight hours and not within any structures located on-site to minimize the need for artificial illumination. The workplace will be free of scattered tools and supplies to minimize slips, trips, and fall hazards.

5.6 HEAT RELATED DISORDERS

Wearing personal protective equipment while conducting site operations puts the individual worker at considerable risk of developing heat-related disorders, collectively called heat stress. Heat emergencies fall into three categories: heat cramps, heat-exhaustion, and heatstroke (i.e., sunstroke). Without intervention and resolution of the problem, muscle cramps caused by loss of salt from heavy sweating can lead to heat-exhaustion (caused by dehydration) which can lead to heatstroke. Early symptoms include dizziness, fatigue, muscle cramps, nausea, profuse sweating, thirst, weakness, and lightheadedness. Later symptoms of heat-exhaustion include cool moist skin, dilated pupils, headache, pale skin, irrational behavior, nausea, vomiting, and unconsciousness. Symptoms of heatstroke are dry, hot, red skin, fever, dark urine, confusion, rapid slow breathing, rapid weak pulse, seizures, small pupils, unconsciousness. On-site personnel will stay hydrated. Mandatory water breaks will be taken every 30 minutes to avoid dehydration. Monitoring will be performed to avoid heat stress, using both oral temperatures and radial pulse rate for all workers engaging in heavy labor at ambient temperatures over 70° F.

5.7 NOISE

Excess exposure to noise above 85 decibels (dBa) is not anticipated during work at the Greve property, however, hearing protection will be mandatory. In general, excess noise is "suspected" when people standing next to each other are not audible to one another. A Hearing Conservation Program has been established by BEII and is in effect for all site locations. The noise level will be monitored continuously with a Quest dosimeter or equivalent. Any noise levels above 85 dBa, the action level, will require earplugs.

5.8 ELECTRICAL HAZARDS

All electrical work, installation and wire capacities shall be in accordance with the provisions of the National electric Code. Power cords will be UL-listed heavy duty and include a grounding plug. All power cords and receptacles shall be inspected before use to ensure that the casings are not cracked, grounding prongs are attached and that there are not other visible defects. If any defects are found, the cord, receptacle or equipment shall be tagged and placed out of use until repaired or disposed of. During equipment maintenance activities, proper lockout procedures will be utilized.

In addition, all equipment used on-site including drill rigs or remediation systems will be a minimum distance of ten-feet from overhead high voltage lines. USA Digalert will be contacted a minimum of two working days prior to initiating subsurface activities.

6. HEALTH AND SAFETY TRAINING

This section describes the health and safety training requirements necessary for participating in field operations at the Greve property.

6.1 TRAINING REQUIREMENTS

BEII employees and subcontractors who enter the site will be trained to be able to recognize and understand the potential hazards to health and safety associated with the site operations. All BEII employees potentially exposed to hazardous substances will have participated in 40 hours of health and safety instruction and actual field experience under the direct supervision of a trained, experienced supervisor. The objectives of the health and safety training are:

- * To make each team member aware of the potential hazards they may encounter;
- * To provide the knowledge and skills necessary to perform the work with minimal risk to worker health and safety;
- * To make workers aware of the purpose and limitations of safety equipment;
- * To ensure that workers can safely avoid or escape from emergency situations.

6.2 ADDITIONAL TRAINING REQUIREMENTS

Workers exposed to special hazards during field operations at the Greve property shall receive additional training as determined by the Project Health and Safety Coordinator. On-site managers and supervisors shall receive all training required for employees whom they supervise, plus eight additional hours of specialized training on management and supervision of such operations. Prior work experience or training will be acceptable provided that it is equivalent to the training requirements specified above. Whenever employees are working on-site, at least one person will be currently certified in Standard First Aid/CPR training.

6.3 DAILY SAFETY MEETINGS

Site-specific "tailgate" safety briefings will be conducted daily by the SSO or his designee to discuss the day's operations, review any modifications to the HASP and ensure that site personnel have the necessary information to conduct their jobs safely. The Tailgate Safety Meeting Form (Attachment 2) will be completed during this briefing and signed by all personnel in attendance. All completed forms shall be maintained on-site. Upon completion of the project, all forms shall be forwarded to the project Health and Safety files.

6.4 TRAINING PROGRAM CONTENT

BEII's Health and Safety Training Program involves instruction, self-study and field exercises in the following areas:

- * Science of Hazardous Materials: Chemical and physical properties of hazardous materials.
- * Toxicology: Dose response, routes of exposure, toxic effects and exposure limits.
- * Industrial Hygiene: Selection and use of proper protective equipment and clothing to ensure minimal contact with contamination, along with the proper methods to decontaminate non-disposable equipment.
- * Decontamination: The methods to don and doff protective equipment and clothing to ensure minimal contact with contamination, along with the proper methods, to decontaminate non-disposable equipment.
- * Emergencies: Potential emergency situations, first aid, self-rescue techniques, emergency drills, Record keeping and investigation.
- * BEII Procedures: All aspects of the BEII Health and Safety Program for Hazardous Waste Site Operations, site-specific HASP, the Corrective Action Plan, and company standard operating procedures regarding these areas:
 - * Names of personnel and alternates responsible for site safety and health;
 - * Known or suspected health and safety hazards;
 - * Proper use of personal protective equipment;
 - * Work Practices to minimize risks;
 - * Safe use of engineering controls and equipment;
 - * Medical surveillance requirements;
 - * Site control measures;
 - * Decontamination procedures.

7. MEDICAL SURVEILLANCE

7.1 GENERAL

A medical surveillance program has been instituted by BEII for all employees with potential exposure to hazardous substances. An initial medical examination is given upon initiation of employment, annually thereafter, and upon termination (if the employee has not had an examination within the last six months). In addition, baseline monitoring and job termination monitoring may be established to document exposure for project personnel. Subcontractors working with hazardous materials or in the site exclusion zones will be required to have their own company medical monitoring plan that meets BEII standards at a minimum.

7.2 EXAMINATIONS

Each team member must have a physical examination prior to working on-site to verify that he/she is physically able to use protective equipment (including respirators), work in hot or cold environments and have no predispositions to occupationally-induced disease. The medical program will also consist of periodic follow-up exams and additional exams as needed to evaluate specific exposures of unexplainable illnesses. The exams will be provided by the San Bernardino Community Hospital or an equally qualified alternate who is Board-certified in Occupational Medicine.

8. PERSONAL PROTECTIVE EQUIPMENT

This section details the level of personal protection to be used during field operations at the Greve property. Appropriate levels of protection have been determined for areas on-site through the information detailed in the site hazard assessment.

8.1 GENERAL

During all field operations, personnel shall wear hardhats, safety glasses, steel toe safety boots, and hearing protection (earplugs and earmuffs). Any coveralls and work boots that are worn on-site should not be worn off-site.

8.2 LEVEL D OPERATIONS

Level D operations will include equipment operators and all site personnel. Level D personnel will wear work Tyvek coveralls and Nitrile gloves, and have in their possession an air purifying respirator (half or full-face) with organic vapor cartridges. Operations requiring Tyvek coveralls, Nitrile gloves and the possession of a respirator will be boring advancement and soil vapor sample collection. Liquid repellent coveralls will be present on site should site activities require that type of protection. Respirator use may be needed during these activities depending on air monitoring concentrations. Those individuals using respirators will follow a site specific change out schedule, which be developed on site. The change out schedule will depend on the air concentrations present, the duty of the work (hard or light labor), number of hours of exposure, temperature, and humidity.

8.3 LEVEL C OPERATIONS

The use of Level C protection at the Greve property is not anticipated. Previous air monitoring on-site has identified no significant concentrations of benzene vapors with a photo-ionization detector (PID), which was identified in free product on groundwater at the site. Nevertheless, Level C protection shall be implemented in areas where task-specific air monitoring indicates that the action level of 1 ppm as BTEX with a PID or 0.1 ppm as chlorinated compounds with a for a 30-minute period. It is not anticipated that this level of air contamination will be present during remediation activities at the site. Level C protective clothing will consist of the general protective gear plus air purifying respirators with organic vapor cartridges. In addition, personnel will wear surgical inner gloves, Nitrile outer gloves, nuke booties and tyvek or saran-coated tyvek coveralls (depending on moisture or splash hazard).

Two photoionization detectors (PID) will be used on-site to monitor the air quality for BTEX and chlorinated components. The PID will be calibrated with isobutylene and hexane. The PID lamps will be 9.5 eV and 10.2 eV. The action level for the use of air purifying respirators will be set at 1 ppm as benzene and 0.1 ppm as chlorinated hydrocarbons. The action level will be inputted into the PID in alarm mode. The PID will be within ten-feet of on-site operations. The PID will continuously monitor the air quality and sound an alarm when action levels are exceeded. To further protect site workers from possible exposure, a rigorous cartridge exchange program will be enforced. Organic vapor/acid gas cartridges will be used in all respirators. All personnel undergo annual respiratory protection training in January of each year.

8.4 LEVEL B OPERATIONS

The use of Level B protection at the Greve property is not anticipated. However, Level B protection shall be used when BTEX air monitoring concentrations exceed 5 ppm and/or chlorinated compounds exceed 0.5 ppm for a 30-minute period. Level B shall consist of all personnel protective equipment described above in Level C operations with the substitution of a pressure demand SCBA with full face piece.

The above levels of protection will be utilized during initial field operations. Upon receiving data from air, soil and water sampling, these levels of protection will be re-evaluated to provide sufficient employee protection while maximizing productivity. A situation may be present in which Level C respiratory protection is utilized while

Level D clothing is used. Criteria for downgrading personnel protective equipment during field activities will be laboratory results indicating no potential for exposure above the Permissible Exposure Level (PEL) for any site contaminant.

9. SITE CONTROL

9.1 SITE SECURITY

No one will be allowed to enter a site work area unless they have been given permission to do so by the Project Manager and the Site Safety Officer, and otherwise follow applicable portions of this HASP. All work areas are secured with a chain linked fence which will be kept locked at all times.

9.2 DECONTAMINATION PROCEDURES

In order to assure that contamination is controlled and not spread from the site, decontamination procedures will be employed for both equipment and personnel. All decontamination activity will be monitored to assure compliance with the procedures described below.

Decontamination of personnel and equipment will be required following the monitoring activities. Decontamination procedures will be developed for both equipment and personnel. A distinction will be made between personnel equipment and monitoring equipment for purposes of decontamination.

9.2.1 STANDARD DECONTAMINATION

All field personnel exiting from the site must pass through a personnel contamination reduction corridor (CRC). At a minimum, all personnel exiting the site will remove all protective clothing and wash their face and hands before entering lunch and break areas to eat, drink or smoke. All personnel will perform a field wash (as defined below) before leaving the site. All coveralls, gloves, and other protective wear will be containerized in 55-gallon drums. Decontamination of equipment will be performed with a triple rinse of Liquinox water, rinse water, and deionized water.

A temporary CRC will be established by spreading a waterproof ground sheet and using several tubs for personnel decontamination. The area will be established by the SSO in discussion with the HSC and BEII Project Manager.

On-site showering will not be required as part of the routine decontamination procedure. However, a shower will be taken at the end of the working day after returning from the site to complete the decontamination process before the next meal or retiring for the day.

Disposal equipment, including respirator cartridges, must be placed in heavy plastic bags or directly into 55-gallon drums for off-site disposal in an approved manner. Used decontamination solutions will also be stored in 55-gallon drums.

9.2.2 EMERGENCY DECONTAMINATION

In the event that a seriously injured person is suspected of being contaminated, the SSO or other site worker will wrap the injured individual in clean plastic sheeting to prevent contamination of the ambulance. Less severely injured individuals will have their protective clothing carefully cut off before transport to the hospital.

9.2.3 COVERALLS

If coveralls are sent off-site for cleaning, the cleaner establishment will be notified of any hazards prior to receiving the coveralls.

9.3 WATER AVAILABILITY

Potable water will be available on-site. In addition, there are readily accessible toilet facilities on-site for personnel use.

9.4 RECORD KEEPING

To assure HASP implementation, many site activities will be documented. These include maintenance of the HASP at the site; employee HASP sign-off; daily safety briefings; site sign-in log; emergency medical data sheets; health and safety log-notes (which include instrument calibration records, sampling data, monitoring results and incident reports); chemical safety data sheets; and other records identified in the HASP. All documents noted are subject to audit and review by the Project Health and Safety Coordinator and/or Certified Industrial Hygienist.

9.5 EMERGENCY RESPONSE PLAN

Emergency response procedures have been developed for extraordinary events that could occur during field operations. These events include accidents and/or injuries, chemical exposure, spills and fires.

In general, the following actions shall be implemented in the event of an emergency:

1. First aid or other appropriate initial action will be administered by those closest to the accident/event. **This assistance will be coordinated by the designated Site Safety Officer and will be conducted so that those rendering assistance are not placed in a situation of unacceptable risk.** The primary concern is to avoid placing a greater number of personnel in jeopardy.
2. The Project Manager, Field Supervisor and Health and Safety Coordinator will be notified immediately. They will in turn notify Greve Financial Services, Inc..
3. An Accident/Incident Report will be completed by the injured individual or witness and Site Supervisor. The Accident Report will then be forwarded to the Project Manager. Upon reviewing and commenting on the accident/incident, the form will be forwarded to the BEII Health and Safety Coordinator who in turn will investigate and make comments on the accident/incident. Any necessary changes to the operation will be made to prevent the same accident or near miss situation from occurring in the future.

9.5.1 ACCIDENTS AND INJURIES

The following response procedures should not be considered inflexible. Every accident presents a unique hazard that must be dealt with by trained personnel working in a calm, controlled manner. In the event of an accident/unusual event, the prime consideration is to provide the appropriate initial response to assist those in jeopardy without placing additional personnel at unnecessary risk.

9.5.1.1 ACCIDENT/INJURY IN CONTAMINATED AREA

If a person working in a contaminated area is physically injured, American Red Cross first aid procedures will be followed. Depending on the severity of the injury, emergency medical response may be sought. If the person can be moved, they will be taken to the edge of the site (on a stretcher, if needed) where contaminated clothing will be removed (if possible), emergency first aid administered and transportation to a local emergency medical facility awaited.

9.5.1.2 ACCIDENT/INJURY IN NON-CONTAMINATED AREA

For accidents/injuries in a non-contaminated hazardous area, the procedures above should be followed with the exception that the injured individual should not be moved and the removal of contaminated clothing would not be necessary.

9.5.2 CHEMICAL EXPOSURE

If the injury to the worker is chemical in nature (e.g., overexposure), the following first aid procedures are generally to be instituted as soon as possible.

9.5.2.1 EYE EXPOSURE

If contaminated solids or liquids get into the eyes, they will be washed immediately for 15 to 30 minutes at the emergency eyewash station using large amounts of water and lifting the lower and upper lids occasionally. Medical attention will be obtained immediately. (Use of contact lenses is not permitted in a designated Exclusion Zone).

9.5.2.2 SKIN EXPOSURE

If contaminated solid or liquid gets on the skin, the affected area will be promptly washed with soap or mild detergent and water. If contaminated solids or liquids penetrate through the clothing, clothing will be immediately removed and the skin washed with soap or mild detergent and water. Medical attention will be obtained if symptoms warrant.

9.5.2.3 INHALATION

If a person inhales a large volume of potentially toxic vapors, they will be moved to fresh air at once. If breathing has stopped, artificial respiration will be performed. The affected person will be kept warm and at rest. Medical attention will be obtained immediately.

9.5.2.4 INGESTION

If contaminated soil or liquid is swallowed, medical attention will be obtained immediately. Before first aid is given, the Poison control Center shall be called.

9.5.3 FIRES

Fire extinguisher will be available on-site in support areas and in all vehicles. Fire extinguisher will be 20 lb. ABC's rated. Personnel will be trained in the proper use of fire extinguisher, techniques for smothering fires and emergency evacuation procedures. All personnel will be instructed to summon the local Fire Department if a fire should occur.

9.5.3.1 SMALL FIRES

In the event of a small fire at the site, the following actions shall be taken:

1. Evacuate all unnecessary personnel from the area;
2. Attempt to extinguish fire using portable fire extinguisher or by smothering (personnel protective equipment may be required);
3. Request emergency response assistance (ambulance, local Fire Department,

hospital, poison control center) as appropriate for any injuries or exposures to hazardous chemicals which occur during suppression of the fire;

4. Notify the BEII Project Manager and Health and Safety Coordinator;
5. Notify Greve Financial Services, Inc..

9.5.3.2 LARGE FIRES

In the event of a large fire, or small fire, which cannot be extinguished, the following actions shall be taken:

1. Evacuate all personnel from the area, preferably to an upwind location;
2. Notify the local Fire Department and other emergency response agencies;
3. Notify the BEII Project Manager and Health and Safety Coordinator;
4. Notify Greve Financial Services, Inc..

9.6 EMERGENCY FOLLOW-UP AND EVALUATION

The BEII Field Supervisor will notify the Project Manager and Health and Safety Coordinator as soon as possible after an emergency situation has been stabilized. The Project Manager will then notify Greve Financial Services, Inc., appropriate agencies and environmental contacts. If an individual is injured, an Accident/Incident Report will be filed with the HSC.

9.7 PROCEDURES FOR REPORTING TO FEDERAL, STATE, AND LOCAL AGENCIES

In all cases, the BEII Project Manager will be notified. He, in turn, will contact the client and any regulatory agencies.

9.8 EMERGENCY EVACUATION PROCEDURES

In the event of a site emergency, all workers at the site will be notified by the SSO or designee to stop work immediately and offer assistance. Those not needed for immediate assistance will decontaminate per normal procedures and leave the site.

9.9 GENERAL SAFE WORK PRACTICES

9.9.1 MINIMIZATION OF CONTAMINATION

Personnel and equipment used in the contaminated area should be minimized, consistent with effective site operations. Only absolutely required samples will be taken back to the laboratory. Contamination will be avoided wherever possible by not kneeling on contaminated ground, avoiding puddles where possible and using plastic drop cloths and equipment covers.

9.9.2 SAMPLING PROCEDURES

Standard operating procedures will minimize the risk of personnel exposure to hazardous materials during sampling, packaging and shipping, and minimize the risk of exposure of others to spilled or residual waste materials.

9.9.3

SAFETY EQUIPMENT

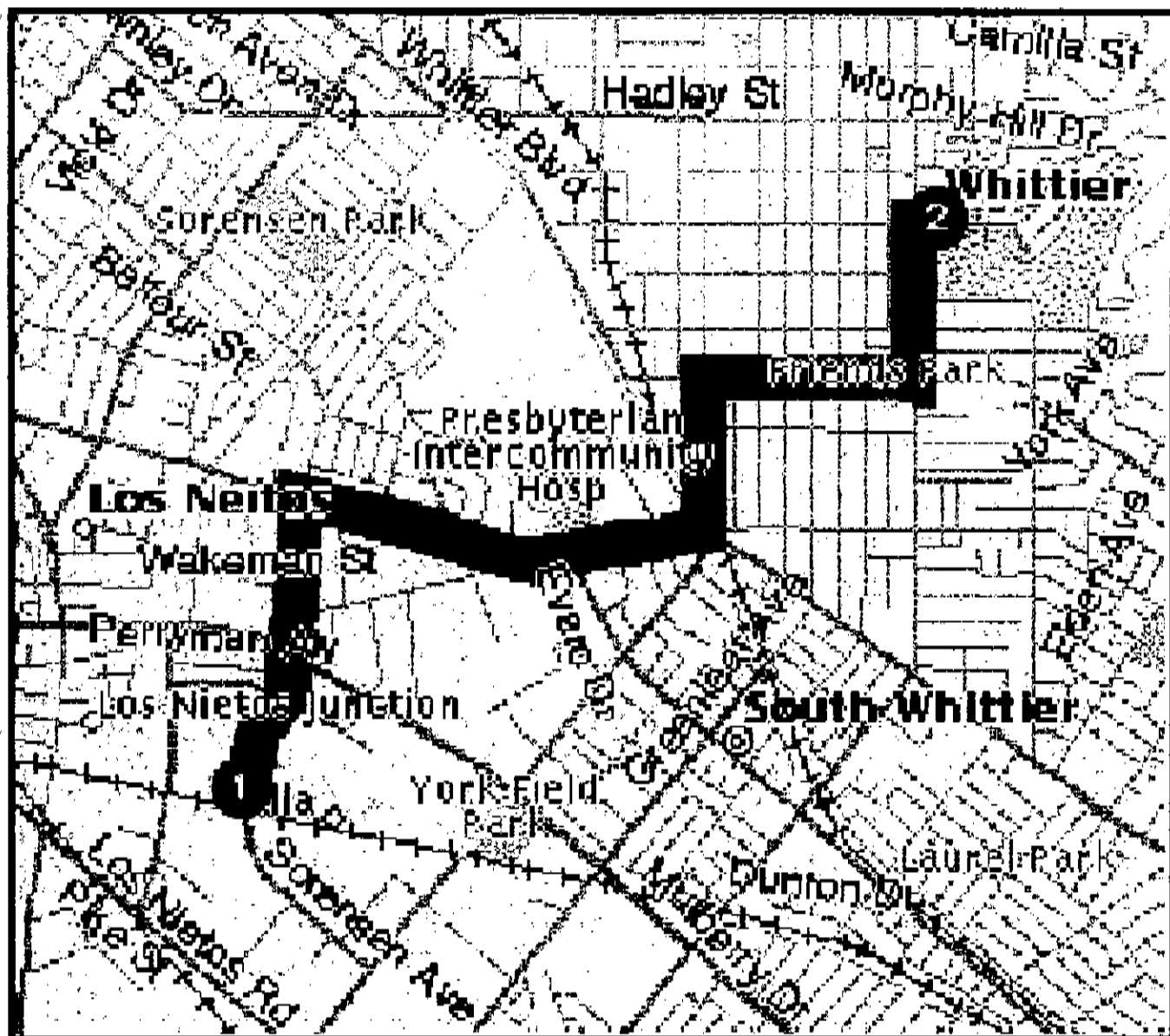
First aid kits and fire extinguishers will be available on-site whenever work is being performed. First aid kits will contain at a minimum the following equipment: large absorbent gauze, adhesive bandages, bandage compresses, gauze pads, eye dressing, scissors, tweezers, triangular bandages, antiseptic pads, first aid book, activated charcoal, syrup of ipecac, burn spray and roller badges. First aid kits will be portable.

9.9.4

FORBIDDEN ACTIVITIES

- a. Eating drinking, chewing gum or tobacco, smoking or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials in any area designated as contaminated;
- b. Ignition of flammable liquids or starting open flames;
- c. Wearing contact lenses on-site;
- d. Use of non-prescription controlled substances or alcohol on-site;
- e. Site work at night.

Appropriate signs will be posted at the site.



Wrightwood

**Blakely Environmental
Investigations, Inc.**
P.O. Box 339
Wrightwood, CA 92397

Hospital Route

Angeles Chemical Company
8915 Sorensen Avenue
Santa Fe Springs, CA

Figure 1

Field Team Review and Emergency Data

I have read and reviewed the most recent revision _____
Date

of the Health and Safety Plan (HASP) for the _____
Project

_____. I understand the information contained therein and will
Site

comply with all aspects of the HASP.

Name: _____

Signature: _____

Date: _____

This information is in case of emergency only:

Social Security #: _____

Person(s) to notify in case of Emergency:

Relationship: _____

Daytime Phone #: _____

Name of Physician: _____ Phone #: _____

Medical Coverage: _____

Employee Date of Birth: _____

*Known Allergies: _____

*Known Medical Conditions: _____

*any known allergies or medical conditions that physicians should be made aware of before
medical attention is given (i.e. allergic to penicillin).

TAILGATE SAFETY MEETING

Facility _____
Date _____ Time _____ Job Number _____

Client _____ **Address** _____

Specific Location _____

Type of Work _____

Chemicals Used

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment _____

Chemical Hazards

Physical Hazards

Emergency Procedures

Hospital/Clinic _____ Phone _____ Paramedic Phone _____

Hospital Address _____

Special Equipment

Other _____

ATTENDEES

Name (printed)

Signature

DATE	DESCRIPTION	AMOUNT	CHECK NO.	DEPOSIT
10/1/20	DEPOSIT	100.00		100.00
10/2/20	PAYROLL	50.00	101	
10/3/20	RENT	25.00	102	
10/4/20	UTILITIES	15.00	103	
10/5/20	SALES	75.00	104	75.00
10/6/20	EXPENSES	30.00	105	
10/7/20	DEPOSIT	120.00		120.00
10/8/20	PAYROLL	55.00	106	
10/9/20	RENT	28.00	107	
10/10/20	UTILITIES	18.00	108	
10/11/20	SALES	80.00	109	80.00
10/12/20	EXPENSES	35.00	110	
10/13/20	DEPOSIT	130.00		130.00
10/14/20	PAYROLL	60.00	111	
10/15/20	RENT	30.00	112	
10/16/20	UTILITIES	20.00	113	
10/17/20	SALES	85.00	114	85.00
10/18/20	EXPENSES	40.00	115	
10/19/20	DEPOSIT	140.00		140.00
10/20/20	PAYROLL	65.00	116	
10/21/20	RENT	32.00	117	
10/22/20	UTILITIES	22.00	118	
10/23/20	SALES	90.00	119	90.00
10/24/20	EXPENSES	45.00	120	
10/25/20	DEPOSIT	150.00		150.00
10/26/20	PAYROLL	70.00	121	
10/27/20	RENT	35.00	122	
10/28/20	UTILITIES	25.00	123	
10/29/20	SALES	95.00	124	95.00
10/30/20	EXPENSES	50.00	125	
10/31/20	DEPOSIT	160.00		160.00

Meeting Conducted by _____

Supervisor _____ **Manager** _____